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An annotated checklist of the mammals of the Chimanimani National Park, Mozambique

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Abstract. The Chimanimani Mountains of Mozambique and Zimbabwe harbour diverse and unique flora and fauna. Because of these unique floral characteristics, this region has received considerable attention by botanists. In contrast, the vertebrates occurring here have received little attention. The aim of this paper was to synthesise data collected on multiple recent surveys into the first annotated checklist of the mammals of the Mozambican side of the Chimanimani Mountains. We identified medium-sized and large mammals by exterior appearance, mostly as captured on camera traps. We combined morphological and molecular methods to identify small mammals, and we report on echolocation calls of some of the poorly known bat species. In total, we recorded 69 species, including 23 species of bats (Chiroptera), 15 species of rodents (Rodentia), 11 species of carnivores (Carnivora), nine species of ungulates (Cetartiodactyla), and the rest comprising Primates, Eulipotyphla, Lagomorpha, Proboscidea, and Pholidota. Of these, five species are listed as threatened, demonstrating the importance of the Chimanimani Mountains for mammalian biodiversity conservation in South Eastern Africa.

Key words. Afromontane, biodiversity, cytochrome b, Eutheria, species inventory, specimens

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INTRODUCTION

Conducting biodiversity surveys is critical for species conservation. The knowledge gained from such surveys is important in identifying and documenting new species and improving understanding of their roles in ecosystems (Allison 2003; Vellend et al. 2008; Halme and Kotiaho 2012; Rovero et al. 2014; Ware et al. 2024; Anderson et al. 2024). This is particularly important for countries that have experienced extensive civil conflicts, such as Mozambique. Such conflicts make it difficult to survey the country's biodiversity and conduct scientific research, especially for many of its understudied areas. Although the first mammals in Mozambique were collected in the 1840s, there was little concerted focus on mammals until the 1960s and early 1970s, when multiple surveys were conducted in different parts of the country (Dalquest 1965; Smithers and Labao 1976; Tinley 2020). However, during the 15 years of post-independence, a lengthy civil war (from 1977 to 1992) effectively prevented any further studies on mammals in Mozambique. Over the past three decades since the end of the civil war, Mozambique has experienced a surge in mammal research, including the publication of a national database (Neves et al. 2018), and checklists for specific taxa, such as bats (Monadjem et al. 2010). In addition, dozens of biodiversity expeditions have been conducted throughout the country, prioritizing remote areas such as Mt Mabu (Bayliss et al. 2014), which has resulted in the discovery of new country records, and the description of several new species (Taylor et al. 2012; Monadjem et al. 2013; Monadjem et al. 2021; Curran et al. 2022).

The Chimanimani Mountains have a unique flora, and as a result have received considerable attention

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by botanists, extending back many decades on the Zimbabwean side of the Chimanimani Mountains (Timberlake et al. 2016). A checklist of the plants of this region has recently been published (Wursten et al. 2017), which includes 977 taxa, a significant proportion of which are endemic to this mountain range (Timberlake et al. 2016; Wild et al. 1964). Compared with plants, the vertebrates of this region are less well known. Some amphibians have been recorded on the Zimbabwean side in previous surveys (Poynton and Broadley 1985), of which one is endemic, *Arthroleptis troglodytes* Poynton, 1963 (Becker and Hopkins 2017). By contrast, practically nothing has been published on the mammals thus far, except that a few species appear to have distributions extending into this region based on the maps in Smithers and Wilson (1979).

The Chimanimani Mountains form the southern limit of the Eastern Afromontane Biodiversity Hotspot, which is ranked as the second most important global hotspot based on endemic genera of vertebrates (Mittermeier et al. 2011), yet it remains poorly studied. To address this, the E.O. Wilson laboratory at Gorongosa National Park, has conducted several extensive surveys, at least one per year since 2016, on the Mozambican side of the Chimanimani Mountains, with a view to assess the vertebrate biodiversity present. This paper is based on these expeditions and is the first published mammal checklist for Chimanimani National Park, Mozambique.

STUDY AREA

The Chimanimani Mountains form part of the Mozambique – Zimbabwe border, between 19.6000°S and 20.0667°S, extending for around 50 km north to south and are about 20 km wide at their widest, covering an area of 530 km^2 (Timberlake et al. 2016). The mountains characteristically comprise quartzite or white sandstone crags, interspersed with grasslands (Timberlake et al. 2016). National parks have been proclaimed on both the Mozambican and Zimbabwean sides of the mountain range (Figure 1).

The Mozambique portion of the mountains lies in the Sussundenga District of Manica Province, with the District Administration at the small town of Sussundenga some 40 km to the northeast. The mountain area on the Mozambican side is protected as the Reserva Nacional de Chimanimani (Timberlake et al. 2016), which we refer to as Chimanimani National Park (Chimanimani NP) here. This park is surrounded by a "buffer zone", within which local communities conduct mostly agricultural practices, and where conservation of wildlife by these communities is encouraged and supported by park officials. The Zimbabwe side of the Chimanimani Mountains falls entirely in the Chimanimani District and was not part of our study area.

The highest peak is Binga, which is on the boundary of Zimbabwe and Mozambique, at an elevation of 2,436 m above sea level, while the foothills to the south and east drop to around 500 m above sea level. Most of the park lies in the montane zone at between 1,000 m and 1,800 m above sea level (Dutton and Dutton 1975). The main wet season in Chimanimani is from November to late March/April, but on the high mountains, rain can occur throughout the year. By extrapolating from similar areas in Zimbabwe, rainfall on the Mozambique side of the mountains is estimated to be between 1,500 and 2,000 mm/year (Phipps and Goodier 1962). The climate is generally considered humid tropical to temperate with average temperatures across the eastern parts of the Chimanimani range being 23–25 °C in January and 17–19 °C in July (Ghiurghi et al. 2010). The vegetation of the Chimanimani Mountains has been described as Afromontane, with *Themeda–Exotheca–Loudetia* submontane and montane grasslands (White 1983). Forming part of this Afromontane regional centre of endemism, are areas that include woodlands, forests, and scrubs within the Chimanimani Mountains (Wild and Barbosa 1968; Timberlake et al. 2016). As a result, the Chimanimani

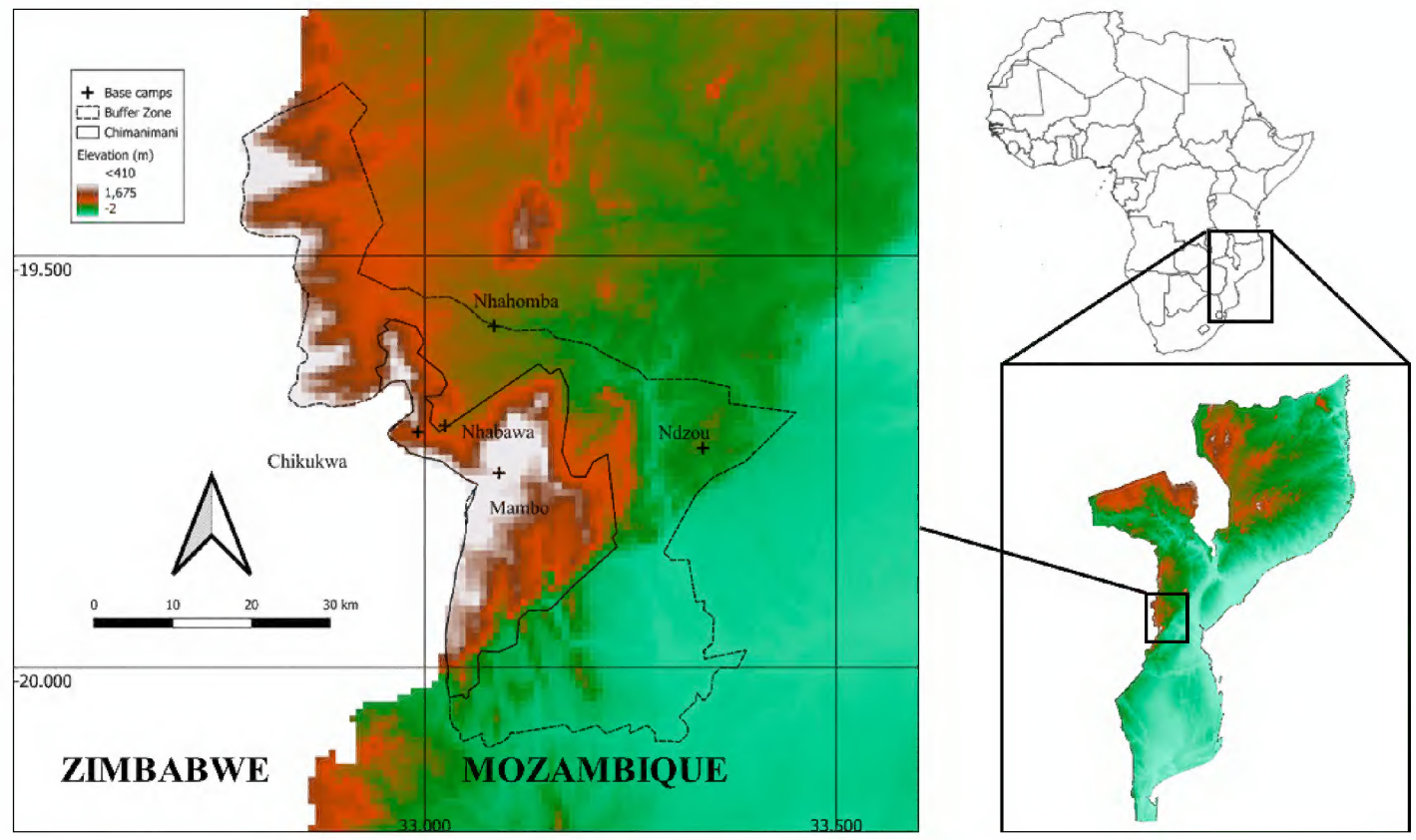

Figure 1. Map of Chimanimani National Park, Mozambique, showing the five main sampling sites (black crosses) where biodiversity surveys have been conducted since 2016. The map also shows a digital elevation layer (white and red shades indicate higher elevations), with boundaries around the core area of the park and the surrounding buffer zone.

Mountains support a wide range of habitats, including various types of grasslands, heathlands, woodlands, and riparian forests (Figure 2).

We surveyed a wide range of elevations and habitats on the Mozambican side of the Chimanimani Mountains, including Chimanimani NP and the buffer zone (Figure 1). Since 2016, we have used six main bases from which to conduct our surveys (five of them are shown in Figure 1; see below for further details), which capture the elevational and habitat diversity within the mountains. The first two base camps of Ndzou and Nhahomba, both in the buffer zone, are at relatively low elevations at the base of the mountains, at 635 m and 648 m a.s.l., respectively, but differ significantly in habitat. Nhahomba is drier and consists primarily of miombo woodland with riparian vegetation along rivers and streams, whereas Ndzou is mostly covered in lowland rainforest. Nhabawa, at 710 m a.s.l., is within the national park and has similar woodland habitat to Nhahomba. The remaining three sites are at increasingly higher elevations, Chikukwa camp at 960 m a.s.l., Binga camp at 1,215 m a.s.l., and Mambo camp at 1,665 m a.s.l. (due to the proximity of Binga and Mambo, we only show the latter on the map in Figure 1). Mambo and Binga camps are both predominantly covered in rolling montane grassland, with a few scattered, small forest patches. Chikukwa is surrounded by large boulders and rocky outcrops on very steep slopes.

METHODS

Sampling. Different groups of mammals require different survey methods, together with their own set of specialized equipment. Hence, we surveyed bats, rodents, shrews, and larger mammals using different techniques. We typically physically captured small mammals, while we captured larger mammals on camera, or we saw either the animal or signs of it e.g. faeces. We handled all captured mammals in accordance

Figure 2. The different types of habitats found in Chimanimani National Park, Mozambique **A.** Open rocky terrain below the summit of Mt. Binga, ca. 2,300 m a.s.l. **B.** High-elevation valley at the foothills of Mt. Binga, valley floor ca. 1,650 m a.s.l. **C.** Marginal evergreen forest with *Strelitzia caudata*, ca. 1,600 m a.s.l. **D.** Miombo woodland near Nhahomba ranger station, ca. 600 m a.s.l. **E.** Mid-elevation miombo near Chikukwa, ca. 1,000 m a.s.l.

with the guidelines of the American Society of Mammalogy for the ethical and safe treatment of mammals (Sikes 2016).

We surveyed bats primarily by capturing them using mist nets and harp traps at appropriately located sites in the Chimanimani Mountains. Both mist nets and harp traps capture bats unharmed; for further information on how these operate refer to Kunz et al. (2009). We erected between one and four nets before sunset and removed them once bat activity had declined (usually around 9 pm). We usually set one or two nets along a stream or other flight paths suitable for bats. We also frequently set up two nets, one above the other, especially around waterbodies where we expected bats to be foraging. We usually left harp traps out all night. In addition, we also deployed bat detectors to record the call of bat species. For the most part, we recorded the calls of hand-released individuals with the aim of developing a bat call library for the Chimanimani Mountains, as has been done elsewhere in the region (e.g. Monadjem et al. 2017; Monadjem et al. 2020a). Such a call library will allow future researchers to identify the calls of at least some of the free-flying bats at this site.

We used Sherman and Tomahawk traps to capture rodents, although they also occasionally captured shrews. The Sherman trap is a box-shaped trap designed for the live capture of small mammals. Tomahawk traps are large metallic box cages designed for capturing and holding animals unharmed. Both work by guiding the entering animal to walk on a treadle that closes the door behind it. For further information on how these traps work see McCleery et al. (2022). We placed Sherman traps, typically in traplines of 10 to 20 traps, with individual traps 10 m apart, in a diverse array of habitats, such as open grasslands, woodlands, riparian forest, montane grassland and montane forest. Traplines were at least 200 m in length and trapping was conducted for four or five nights consecutively. We baited traps with a mixture of peanut butter, oats, sunflower seeds, and raisins to attract a wide range of species (Kok et al. 2013). All Sherman traps were checked daily, usually commencing just after sunrise, to reduce stress and prevent dehydration of captured animals.

We captured shrews primarily by employing pitfall traps, which consisted of buckets dug into the ground with a drift fence made of builder's plastic sheeting that connected the buckets (Nicolas et al. 2003; McCleery et al. 2022). We typically placed five buckets, each dug into the ground, 5 m apart that constituted one pitfall trapline. We employed between one and two such pitfall traplines per site, and each was operated between five and eight nights. All buckets were checked daily, early in the morning.

We recorded all other mammals by sightings, spoor, faeces, and any other signs such as burrows (e.g., aardvark) or dropped quills (e.g., porcupine), which we photographed for future reference. In addition, we deployed a small number of camera traps along suspected animal trails (Francesco Rovero 2010).

Voucher specimens and morphological examination. We collected voucher specimens of each species and deposited them in the following museums: E.O. Wilson Laboratory, Gorongosa National Park, Mozambique (EOWL), the Maputo Natural History Museum, Mozambique, and the Eswatini National Museum of Natural History at the University of Eswatini, Eswatini (ENMNH) for confirmation of identifications and future reference. To this end, we examined the external and craniodental features of each specimen. We took standard external measurements and mass for all small mammal specimens, including head-body length (HB), tail length (TL), hindfoot length (HF/cu), ear length (EAR) and body mass (Mass), and the forearm length (FA) of bats (McCleery et al. 2021). We then took several craniodental measurements for bats including: greatest skull length (GSKL), condyle-incisive length (CIL), zygomatic breadth (ZYGO), mastoid breadth (MAST), greatest breadth of braincase (GBW), narrowest breadth of skull (INTER), length of upper toothrow (C-M3), width across canines (C-C), width across upper molars (M3-M3) and mandibular length (MAND) (see Monadjem et al. 2020b for definitions). For rodents and shrews, we took greatest skull length (GSKL), condyle-incisive length (CIL), zygomatic breadth (ZYGO), bimaxillary width (BW) (shrews only), upper toothrow (UTRL) (shrews only), length of upper cheekteeth row (M1-M3) (rodents only), greatest width across upper molars (M3-M3) and mandibular length (MAND) (Nicolas et al. 2010; Stanley and Hutterer, 2000). We also noted other morphological features such as the colour and patterning of the fur, shape of nose-leaf, and scales on tail. The voucher specimens collected for each species were euthanized using cotton wool infused with chloroform in a glass jar.

DNA sequencing and phylogeny. For some specimens of bats, rodents, and shrews we collected tissue samples, generally of either the liver or muscle (or both), which were sent off for molecular analysis. In this study, 16 samples were sequenced. In addition, reference mtDNA sequences were obtained from the National Centre for Biotechnology Information (NCBI) GenBank, as summarized in the Appendix Table A1. All sequences generated here have been deposited in GenBank (accession numbers in Appendix Table A2). Genomic DNA was isolated from tissue samples using the QIAamp DNA Investigator Kit (Qiagen, Germany) or the DNeasy tissue and blood kit (Qiagen, Germany). Tissue samples were cut with a scalpel blade and were subsequently digested for approximately 2 hours in Proteinase K and ATL tissue lysis buffer. Following digestion, DNA was isolated according to the manufacturer's instructions. We typically sequenced approximately 1,300 bp of the mitochondrial cytochrome b gene (cyt-b), using primers L14724 and H15915 described by Pääbo et al. (1988) and Irwin et al. (1991). In a few cases, we also sequenced approximately 620 bp of the mitochondrial COI gene. The COI gene was amplified using the universal conservative primers BatL5310 and R6036R (Hebert et al. 2003). The COI and cyt-b genes are two of the most used genetic

loci in species identification and have been widely used in systematic studies to reconstruct the phylogeny of mammals at different levels of the taxonomic hierarchy. In general, amplification of the various gene regions was conducted using Taq DNA Polymerase 2x Master Mix RED (Ampliqon) at a final concentration of 1.5 mM of $MgCl_2$, 0.2 mM of each dNTP, 0.05 M Tris/HCl pH 8.5, $(NH_4)_2SO_4$ and 0.1 units μl^{-1} Taq DNA polymerase. Additionally, 0.1 µM of the forward and reverse primers and 2-4 µl of DNA template (50 ng/µl) was added and the mixture was made up to a final reaction volume of 15 µl with ddH_2O. Targeted gene regions were amplified in a SimpliAmp Thermocycler (Thermo Scientific, California, USA). The PCR protocol consisted of an initial cycle of 15 mins at 95 °C followed by 30 cycles of 95 °C for 30 s; 50–60°C for 1 min 30 s and 72 °C for 1 min, with a final extension step of 72 °C for 20 mins. Amplification was confirmed by agarose gel electrophoresis. The PCR products were purified using 5 U of Exonuclease I (Thermo Fisher Scientific) and 1 U FastAP™ Thermosensitive Alkaline Phosphatase (Thermo Fisher Scientific). The cycle sequencing reactions were prepared using the BigDye™ Terminator kit 3.1 (Applied Biosystems) as per manufacturer's instructions. Cycle sequencing products were purified using BigDye™ Xterminator sequencing clean-up Kit (Thermo Fisher Scientific) as per manufacturer's instructions. Sequences were visualised on the ABI PRISM 3500 or 3730XL Genetic Analyser (Thermo Fisher Scientific). Raw sequences were checked in BioEdit software package v.7.0.9.0 (Hall, 1999) and sequence alignments were generated using Clustal W (Thompson et al. 1994) in BioEdit. Sequences were also visually inspected, manually trimmed, and checked for ambiguous peaks. We determined the best fitting substitution model in MEGA7 (Kumar et al. 2018). Phylogenetic relationships were reconstructed by the ML method in MEGA7 using the Tamura-Nei (TN93) substitution model with a gamma distribution and invariable sites (+ G + I) for COI (bats), Hasegawa-Kishino-Yano (HKY) + G + I model for Cytb (bats), generalised time reversible (GTR) + G + I model for Cytb (rodents) GTR + G for COI (rodents) and TN93 + G + I for Cytb (shrews). Branch support values were estimated using non-parametric bootstrapping with 1,000 replicates. A bootstrap support value of 70% or more was considered to indicate a robustly supported node.

RESULTS

We recorded a total of 69 mammal species (Table 1). Of these, 23 species were bats (Chiroptera), 15 were rodents (Rodentia), and three were shrews (Eulipotyphla), resulting in a total of 41 (59%) of the species recorded being small mammals. Of the remainder, there were 11 species of carnivores (Carnivora), nine species of antelopes/pigs (Cetartiodactyla), four species of Primates, two species of hares (Lagomorpha), one species of elephant (Proboscidea), and one species of pangolin (Pholidota).

In the following section, we present an annotated checklist of the mammal species recorded from Chimanimani National Park (hereafter referred to as Chimanimani NP), on the Mozambique side of the mountains. In the species accounts below (under Material examined) we only report one specimen from each site. However, in Table 1, we present the total number of specimens captured or recorded for each species at each site.

Order Chiroptera
Family Pteropodidae

***Epomophorus crypturus* Peters, 1852**
Figure 3G

Material examined. Manica Province • Nhahomba; −19.05950, 033.0856; 614 m a.s.l.; EOWL: AM_2018_11_29_09B. Collected with mist nets; 1 adult ♀.

Identification. Distinguished from *E. wahlbergi* by the presence of two palatal ridges behind the last molars of the upper jaw (Taylor and Monadjem 2008).

Biology and distribution. This species was captured in riparian forest 600 m above sea level.

***Epomophorus wahlbergi* (Sundevall, 1846)**
Figure 3F

Material examined. Manica Province • Nhahomba; −19.05852, 033.0842; 575 m a.s.l.; EOWL: AM_2018_11_27_01B; Chikukwa; −19.07146, 32.9842; 980 m a.s.l.; EOWL: AGC005; Ndzou; −19.07408, 033.3215; 532 m a.s.l. Captured with mist nets; 4 adult ♀, 1 adult ♂.

Identification. Distinguished from *E. crypturus* by the presence of one palatal ridge behind the last molars of the upper jaw (Taylor and Monadjem 2008).

Biology and distribution. This species was captured in multiple habitats including riparian forest, savanna woodland, swamp forest, lowland forest, miombo woodland, and rocky outcrops, at elevations between 500 m and 1,000 m above sea level.

Table 1. Overview of the 69 species of mammals (Mammalia) captured at five sampling sites in Chimanimani National Park, Mozambique, including their conservation status. The numbers refer to the number of individuals captured or recorded for each species at each of the five sampling sites. The latest IUCN Red List status (downloaded in March 2024 from www.iucnredlist.org) is presented. Red List categories: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, DD = Data Deficient, NE = Not Evaluated. The numbers of specimens per site may not always align with the number of specimens reported in the species accounts because we only mentioned one specimen per site in the accounts (see Methods for further details).

Order/Family/Species	Red List	Ndzou	Nhahomba	Nhabawa	Chikukwa	Mambo
Chiroptera						
Pteropodidae						
Epomophorus crypturus	LC	—	1	—	—	—
Epomophorus wahlbergi	LC	1	2	—	2	—
Rhinolophidae						
Rhinolophus clivosus	LC	—	—	7	6	2
Rhinolophus deckenii	NT	4	—	—	—	—
Rhinolophus fumigatus	LC	—	3	—	1	—
Rhinolophus rhodesiae		—	—	—	2	—
Rhinolophus smithersi	NT	—	—	1	8	—
Nycteridae						
Nycteris sp.	LC	—	—	—	4	—
Molossidae						
Mops pumilus	LC	—	2	—	—	—
Vespertilionidae						
Eptesicus hottentotus	LC	—	—	—	—	1
Laephotis angolensis	DD	—	1	—	—	—
Laephotis capensis	LC	—	6	—	—	9
Myotis bocagii	LC	—	5	—	—	—
Myotis tricolor	LC	—	3	2	3	4
Myotis welwitschii	LC	—	—	1	—	—
Afronycteris nana	LC	—	—	1	—	—
Nycticeinops schlieffeni	LC	—	2	—	—	—
Pipistrellus hesperidus	LC	2	—	—	—	—
Pipistrellus rusticus	LC	—	5	1	—	—
Scotoecus hindei	LC	—	2	—	—	—
Scotophilus dinganii	LC	4	—	—	—	—
Scotophilus viridis	LC	3	1	—	—	—
Miniopteridae						
Miniopterus wilsoni		—	1	—	2	—
Rodentia						
Gliridae						
Graphiurus murinus	LC	1	—	—	—	—
Muridae						
Acomys spinosissimus	LC	2	9	1	8	—
Aethomys chrysophilus	LC	1	4	1	—	—
Gerbilliscus leucogaster	LC	—	1	2	—	—
Grammomys cometes		1	—	—	1	—
Lemniscomys rosalia	LC	—	3	—	—	—
Mastomys natalensis	LC	1	6	5	—	—
Micaelamys namaquensis	LC	—	—	—	4	3
Mus minutoides	LC	—	3	—	3	—
Rhabdomys dilectus	LC	—	—	—	—	6
Uranomys ruddi	LC	1	—	—	—	—
Nesomyidae						
Cricetomys ansorgei	LC	1	—	—	—	—
Dendromus mesomelas	LC	—	—	—	—	2
Sciuridae						
Heliosciurus mutabilis	LC	—	1	—	—	—
Hystricidae		—	—	—	—	—

Order/Family/Species	Red List	Ndzou	Nhahomba	Nhabawa	Chikukwa	Mambo
Hystrix africaeaustralis	LC	1	—	—	—	—
Eulipotyphla						
Soricidae						
Crocidura olivieri	LC	2	—	—	—	1
Myosorex meesteri	LC	—	—	—	—	11
Crocidura cyanea	LC	—	—	—	—	2
Pholidota						
Manidae						
Smutsia temminckii	VU	—	—	—	—	2
Carnivora						
Canidae						
Canis adustus	LC	1	—	—	2	—
Hyaenidae						
Crocuta crocuta	LC	—	—	—	1	—
Felidae						
Leptailurus serval	LC	—	—	—	—	1
Herpestidae						
Atilax paludinosus	LC	1	—	—	—	—
Bdeogale crassicauda	LC	—	—	—	2	—
Galerella sanguinea	LC	—	—	—	3	—
Ichneumia albicauda	LC	—	—	—	1	—
Mustelidae						
Aonyx capensis	NT	—	—	—	1	—
Viverridae						
Genetta maculata	LC	—	—	—	2	—
Civettictis civetta	LC	—	—	—	1	—
Nandinia binotata	LC	—	—	—	1	—
Cetartiodactyla						
Suidae						
Potamochoerus larvatus	LC	—	—	1	1	—
Phacochoerus africanus	LC	—	—	—	1	—
Bovidae						
Oreotragus oreotragus	LC	1	—	—	1	1
Hippotragus niger	LC	—	1	1	—	—
Kobus ellipsiprymnus	LC	—	1	—	—	—
Taurotragus oryx	LC	—	1	—	—	—
Redunca arundinum	LC	—	—	1	—	—
Sylvicapra grimmia	LC	1	—	1	1	—
Tragelaphus scriptus	LC	—	—	—	3	—
Proboscidea						
Elephantidae						
Loxodonta africana	EN	1	—	—	—	—
Lagomorpha						
Leporidae						
Pronolagus randensis	LC	1	—	1	1	—
Lepus victoriae	LC	—	1	—	—	—
Primates						
Cercopithecidae						
Cercopithecus mitis	LC	1	—	—	2	—
Papio ursinus	LC	1	—	1	4	—
Galagidae						
Otolemur crassicaudatus	LC	—	—	—	1	1
Paragalago granti	LC	—	—	—	—	1

Figure 3. Chiroptera species from the families Vespertilionidae, Molossidae, and Pteropodidae recorded from Chimanimani National Park, Mozambique **A.** *Scotophilus dinganii* **B.** *Laephotis capensis* **C.** *Laephotis angolensis* **D.** *Laephotis angolensis* **E.** *Mops pumilus* **F.** *Epomophorus wahlbergi* **G.** *Epomophorus crypturus.*

Family Rhinolophidae

***Rhinolophus clivosus* Cretzschmar, 1828**
Figures 4B, 7B

Material examined. Manica Province • Mambo; −19.07637, 033.0901; 1,665 m a.s.l.; EOWL: AM_2021_11_28_06; Nhabawa; −19.07063, 033.0245; 713 m a.s.l; EOWL: AGC012; Chikukwa; −19.07146, 32.9842; 980 m a.s.l.; EOWL: AGC001; Binga; −19.07500, 033.0567; 1,215 m a.s.l; EOWL: AGC059. Collected with mist nets; 7 adult ♀, 8 adult ♂.

Identification. Distinguished from other *Rhinolophus* species by having a buffy-brown to grey pelage with a high and rounded connecting process, and the tiny upper premolar outside of the toothrow (Monadjem et al. 2020a).

Biology and distribution. This species was captured in riparian forest at elevations from 700 m to 1,700 m, above sea level. This species echolocated at 88-89 kHz (Figure 7B).

***Rhinolophus deckenii* Peters, 1868**
Figures 4C, 7C

Material examined. Manica Province • Ndzou; −19.07408, 033.3215; 532 m a.s.l.; EOWL: AM_2018_12_04_01B. Collected with mist nets; 3 adult ♀, 1 adult ♂.

Identification. Distinguished from other *Rhinolophus* species by having a dark brown pelage with a low and rounded connecting process (Monadjem et al. 2020a).

Biology and distribution. This species was captured in riparian forest at elevations between 500 m to 600 m above sea level. This species echolocated at 73-74 kHz (Figure 7C).

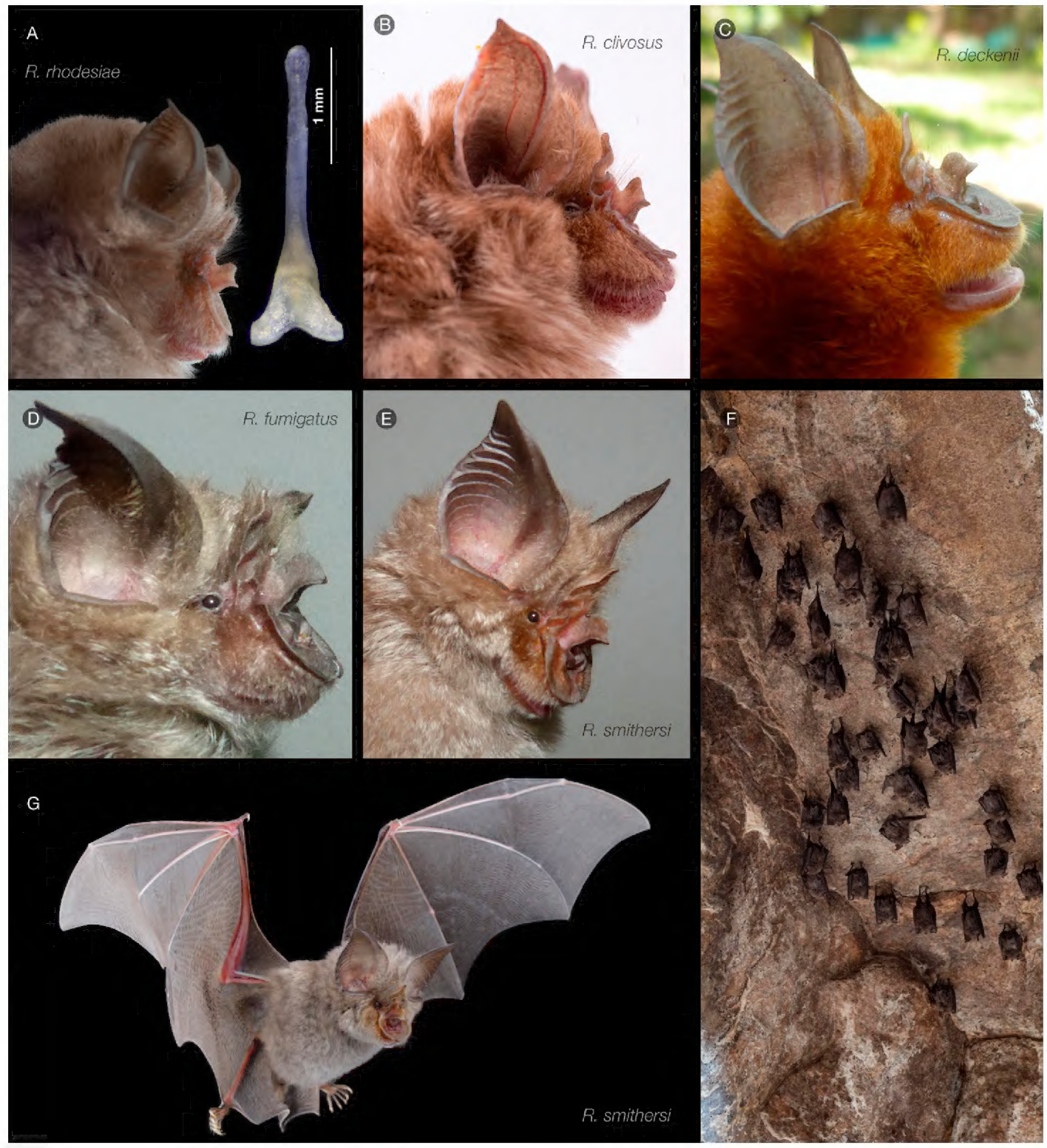

Figure 4. Chiroptera species from the family Rhinolophidae recorded from Chimanimani National Park, Mozambique **A.** *Rhinolophus rhodesiae* (inset shows the baculum) **B.** *Rhinolophus clivosus* **C.** *Rhinolophus deckenii* **D.** *Rhinolophus fumigatus* **E.** *Rhinolophus smithersi* **F.** *Rhinolophus smithersi* **G.** *Rhinolophus smithersi*.

***Rhinolophus fumigatus* Rüppell, 1842**
Figures 4D, 7D

Material examined. Manica Province • Nhahomba; −19.05950, 033.0856; 614 m a.s.l.; EOWL: AM_2018_11_29_03B; Chikukwa; −19.07121, 32.9903; 1,027 m a.s.l.; EOWL: AGC0134. Collected with mist nets; 3 adult ♀, 1 adult ♂.

Identification. Distinguished from other *Rhinolophus* species by having a grey-brown dorsal pelage and light grey ventral pelage, with a low and rounded connecting process (Monadjem et al. 2020a).

Biology and distribution. This species was captured in riparian forest and savanna woodland at elevations between 600 m and 1,000 m above sea level. This species echolocated at 60 kHz (Figure 7D).

***Rhinolophus rhodesiae* Roberts, 1946**
Figures 4A, 7A

Material examined. Manica Province • Chikukwa; −19.07121, 32.9903; 1,027 m a.s.l.; EOWL: AGC0135. Collected with mist nets; 1 adult ♀, 1 adult ♂.

Identification. Distinguishable genetically and smaller than *R. swinnyi*, with a longer tapered baculum compared to other *Rhinolophus* species (see Figure 4A) (Taylor et al. 2018).

Biology and distribution. This species was captured emerging from Chikukwa Cave at an elevation of 1,000 m above sea level, in mixed woodland and grassland. This species was recorded echolocating at peak frequency of 102-103 kHz (Figure 7A), similar to the 100 kHz reported by Taylor et al. (2018).

***Rhinolophus smithersi* Taylor et al., 2012**
Figures 4E–G, 7E

Material examined. Manica Province • Chikukwa; −19.07121, 033.9902; 1,026 m a.s.l.; EOWL:

AM_2018_12_01_06B; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; EOWL: AGC013. Collected with mist nets; 9 adult ♂.

Identification. Distinguished from the more widespread *R. mossambicus* in Mozambique by its higher echolocation call, and it is genetically distinct from other species in the *hildebrandtii* group (Taylor et al. 2012).

Biology and distribution. A small colony of around 50 individuals of this species roosted in Chikukwa Cave at 1,000 m above sea level. It was also captured in riparian vegetation at 700 m above sea level on the slopes below the cave. It echolocated at 44-45 kHz (Figure 7E).

Family Nycteridae

***Nycteris* sp.**

Material examined. MANICA PROVINCE • Chikukwa; −19.07122, 32.9902; 1,037 m a.s.l.; EOWL: AGC026. Captured with mist nets; 1 adult ♂.

Identification. Distinguished from other bats in the region by their large ears and partially covered nose leafs (Monadjem et al. 2020a). However, this species was neither taken as a specimen, nor photographed, hence its species-level identification remains uncertain.

Biology and distribution. Captured emerging from its roosting site in the Chikukwa caves at an elevation of 1,000 m above sea level.

Family Molossidae

***Mops pumilus* (Cretzschmar, 1826)**
Figures 3E, 8J

Material examined. MANICA PROVINCE • Nhahomba; −19.05858, 033.0850; 591 m a.s.l.; EOWL: AM_2018_11_29_10B. Collected with mist nets; 1 adult ♀, 1 adult ♂.

Identification. Distinguished from other molossids by its smaller size and white flanks (Monadjem et al. 2020a).

Biology and distribution. This species was captured emerging from its roost in the roof of the entrance of an office building at Nhahomba at 590 m above sea level. Its echolocation call, recorded outside of its roost, had a peak frequency of ca. 26 kHz (Figure 8J). This species was the only molossid recorded from Chimanimani National Park, although several other species occur in central Mozambique (Monadjem et al. 2010).

Family Miniopteridae

***Miniopterus wilsoni* Monadjem et al., 2020**
Figure 5A, B

Material examined. MANICA PROVINCE • Nhahomba; −19.06041, 033.0753; 637 m a.s.l.; EOWL: AGC0133; Chikukwa; −19.07146, 32.9842; 980 m a.s.l.; EOWL: AGC007. Collected with mist nets; 2 adult ♂, 1 adult ♀.

Identification. Only recently described from Mount Gorongosa (Monadjem et al. 2020b). It is distinguished by its small skull and larger forearm than *M. mossambicus*, which tends to occur at lower elevations in Mozambique.

Biology and distribution. A single specimen was captured at Nhahomba in riparian vegetation 600 m above sea level, and a second at Chikukwa.

Family Vespertilionidae

***Afronycteris nana* (Peters, 1852)**
Figure 8I

Material examined. MANICA PROVINCE • Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; EOWL: AGC046. Collected with mist nets; 1 adult ♂.

Identification. Distinguished from other vesper bat species by having bicoloured fur, distinctly swollen pads at the base of the joint of the thumb, and a dome-shaped cranium, with two equally long incisors and a tiny upper premolar (Monadjem et al. 2020a).

Biology and distribution. A single specimen was captured in riparian vegetation in Nhabawa at 700 m above sea level. It was recorded echolocating with a peak frequency of 70kHz (Figure 8I).

Figure 5. Chiroptera species from the families Miniopteridae and Vespertilionidae recorded from Chimanimani National Park, Mozambique **A.** *Miniopterus wilsoni* **B.** *Miniopterus wilsoni* **C.** *Myotis tricolor* **D.** *Myotis tricolor* **E.** *Myotis bocagii* **F.** *Myotis welwitschii* (photo by J. Guyton) **G.** *Nycticeinops schlieffeni*.

***Eptesicus hottentotus* Smith, 1833**

Material examined. Manica Province • Mambo; −19.07637, 033.0901; 1,665 m a.s.l.; Captured with mist nets but not collected.

Identification. Distinguished from other vesper bat species by its large size and its short and rounded tragus, which distinguishes it from *Scotophilus* species (Monadjem et al. 2020a).

Biology and distribution. This species was captured at a small pond in montane grassland at 1,670 m above sea level. This species escaped from its holding bag before it could be photographed.

***Laephotis angolensis* Monard, 1935**

Figures 3C, D, 8E

Material examined. Manica Province • Nhahomba; −19.06041, 033.0753; 637 m a.s.l.; EOWL: AGC0132. Collected with mist nets; 1 adult ♂.

Identification. Distinguished from other vesper species by its uniquely long ears and large, triangular tragus (Monadjem et al. 2020a). Previously known by the name *Laephotis botswanae*, which has recently been shown to be conspecific with *L. angolensis* (Taylor et al. 2022). This is the first record of this species from Mozambique (Monadjem et al. 2020a).

Biology and distribution. A single individual was captured in riparian forest at an elevation of 640 m above sea level. Echolocation call of this individual flying in confined space showed a broad bandwidth, with a peak frequency around 40-50 kHz (Figure 8E).

***Laephotis capensis* (Smith, 1829)**

Figures 3B, 8F

Material examined. Manica Province • Nhahomba; −19.05950, 033.0856; 614 m a.s.l.; EOWL: AM_2018_11_29_04B, EOWL: AM_2018_11_29_08B, AM_2018_12_01_05B, AM_2018_12_02_02B; Mambo;

−19.07562, 033.0952; 1,688 m a.s.l.; EOWL: AM_2021_12_01_01. Collected with mist nets; 4 adult ♀, 11 adult ♂.

Identification. Distinguished from other vesper bat species by its bicoloured fur, short and broad tragus, lack of thumbpad, and the lack of upper tiny premolar (Monadjem et al. 2020a). Furthermore, all three sequenced specimens matched that of *Laephotis capensis* in both the COI and Cytb genes (Appendices 1 and 2).

Biology and distribution. This species was captured near water, but in contrasting habitats, from woodland to forest-edge at elevations ranging from 600 m to 1,700 m above sea level. Specimen AM_2018_11_29_04B was recorded echolocating in confined space with a peak frequency of 42 kHz (Figure 8F).

Myotis bocagii Peters, 1870

Figures 5E, 8C

Material examined. Manica Province • Nhahomba; −19.06351, 033.0696; 637 m a.s.l.; EOWL: AM_2018_12_01_04B. Collected with mist nets; 4 adult ♀, 1 adult ♂.

Identification. Distinguished from other vesper bat species by having a coppery to orange dorsal pelage and cream ventral pelage, with a long and narrow tragus. Its forearm length is shorter than *M. tricolor*, with no overlap (Monadjem et al. 2020a).

Biology and distribution. This species was only captured around Nhahomba, always near water, at about 600 m above sea level. A released individual exhibited the characteristic steep, almost vertical, calls of this species, sweeping from about 90 kHz down to 25 kHz, with a peak frequency around 45 kHz (Figure 8C).

Myotis tricolor (Temminck, 1832)

Figure, 5C, D, 8D

Material examined. Manica Province • Nhahomba; −19.06351, 033.0696; 637 m a.s.l.; EOWL: AM_2018_12_01_02B; Mambo; −19.07652, 033.0892; 1,668 m a.s.l.; EOWL: AM2021_11_27_07; Chikukwa; −19.07122, 32.9902; 1,037 m a.s.l.; EOWL: AGC033; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; EOWL: AGC036; Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC060. Collected with mist nets; 6 adult ♀, 6 adult ♂.

Identification. Distinguished from other vesper bat species by having a coppery to orange dorsal pelage and paler ventral pelage, with a long and narrow tragus. It is significantly larger than *M. bocagii*, and their forearm lengths do not overlap (Monadjem et al. 2020a).

Biology and distribution. This species was captured in a variety of habitats from 600 m to 1,700 m above sea level, but usually near water, including in riparian forest, woodland, and montane grassland. A released individual exhibited steep, almost vertical, calls sweeping from about 100 kHz down to 40 kHz, with a peak frequency around 58 kHz (Figure 8D).

Myotis welwitschii (Gray, 1866)

Figure 5F

Material examined. Manica Province • Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; EOWL: AGC032. Collected with mist nets; 1 adult ♂.

Identification. Distinguished from other vesper bat species by having a coppery to orange dorsal pelage and paler ventral pelage, with a long and narrow tragus and copper-coloured membranes with black spots and blotches (Monadjem et al. 2020a).

Biology and distribution. A single specimen was collected in riparian vegetation in Nhabawa at 700 m above sea level.

Nycticeinops schlieffeni (Peters, 1859)

Figure 5G

Material examined. Manica Province • Nhahomba; −19.05950, 033.0856; 614 m a.s.l.; EOWL: AM_2018_11_29_01B. Collected with mist nets; 2 adult ♂.

Identification. Distinguished from other vesper bat species by having unicoloured fur that is characteristically gingery-orange in colour, a short and hooked tragus, and one upper incisor. *Scotoecus* cf. *hindei* also has a single upper incisor, but its skull is flattened, and it has dull brown pelage compared with bright orange-brown in *N. schlieffeni* (Monadjem et al. 2020a). The specimen was sequenced and matched that of *N. schlieffeni* based on Cytb reference sequences (Appendix 1).

Biology and distribution. Two specimens were collected at the same site at Nhahomba in riparian forest 600 m above sea level.

Figure 6. Chiroptera species from the family Vespertilionidae recorded from Chimanimani National Park, Mozambique **A.** *Pipistrellus rusticus* **B.** *Pipistrellus rusticus* **C.** *Pipistrellus hesperidus* **D.** *Scotoecus* cf *hindei* **E.** *Scotophilus viridis* **F.** *Scotophilus viridis*.

***Pipistrellus hesperidus* (Temminck, 1840)**
Figures 6C, 8G

Material examined. Manica Province • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_03_01B, AM_2018_12_05_02B. Collected with mist nets; 2 adult ♂.

Identification. Distinguished from other vesper bat species by its bicoloured fur, presence of upper tiny premolar and non-bifid upper incisors. It is easily distinguished from *P. rusticus* by larger size (non-overlapping cranial features) and drab, brown pelage (Monadjem et al. 2020a). These two specimens were also identified based on their Cytb sequences (Appendix 1).

Biology and distribution. Two specimens were captured at Ndzou in lowland forest habitat between 500 and 600 m above sea level. The echolocation call of a released individual had peak frequency of 49 kHz (Figure 8G).

***Pipistrellus rusticus* (Tomes, 1861)**
Figures 6A, B, 8H

Material examined. Manica Province • Nhahomba; −19.05950, 033.0856; 614 m a.s.l.; EOWL: AM_2018_11_29_02B; AM_2018_11_29_07B; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; EOWL: AGC041. Collected with mist nets; 5 adult ♀, 1 adult ♂.

Identification. Distinguished from other vesper bat species by the presence of the tiny upper premolar and pale rust dorsal pelage and paler greyish-rust ventral pelage (Monadjem et al. 2020a).

Biology and distribution. This species was captured at Nhahomba, where it was recorded in riparian vegetation at an elevation of above 600 m above sea level, and at Nhabawa in similar habitat. Echolocation calls of an individual released had a peak frequency of 48–50 kHz (Figure 8H).

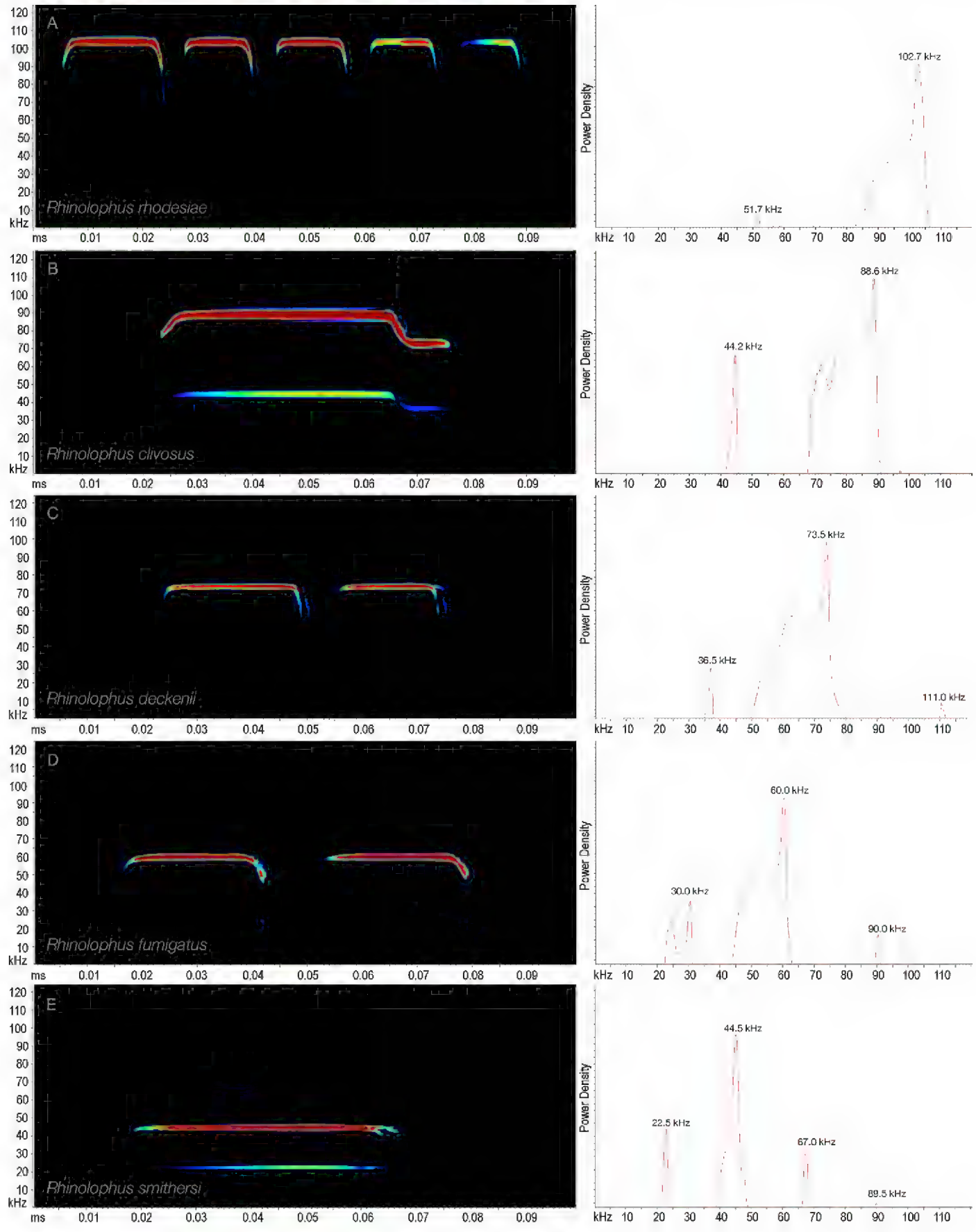

Figure 7. Chiroptera species from the family Rhinolophidae, echolocation recordings from Chimanimani National Park, Mozambique **A.** *Rhinolophus rhodesiae* **B.** *Rhinolophus clivosus* **C.** *Rhinolophus deckenii* **D.** *Rhinolophus fumigatus* **E.** *Rhinolophus smithersi.*

Scotoecus cf. *hindei* Thomas, 1901

Figure 6D

Material examined. Manica Province • Nhahomba; −19.06044, 033.0754; 654 m a.s.l.; EOWL: AM_2018_12_02_03B, AM_2018_12_02_04B. Collected with mist nets; 2 adult ♀.

Identification. Two species of *Scotoecus* have been recorded from southern Africa, but they cannot be distinguished morphologically, and they have not been genetically characterised, and hence we follow Monadjem et al. (2020a) in referring to this species as *S.* cf. *hindei*. *Scotoecus* cf. *hindei* was distinguished from other vesper bat species by its unicoloured fur, a club-like tragus, flattened skull, and a single upper incisor. *Nycticeinops schlieffeni* also has a single upper incisor, but its skull is not flattened and it is ginger-coloured (Monadjem et al. 2020a).

Biology and distribution. Two specimens were captured at Nhahomba in riparian vegetation at 650 m above sea level.

Scotophilus dinganii (Smith, 1833)

Figure 3A

Material examined. Manica Province • Ndzou; −19.07408, 033.3215; 532 m a.s.l.; EOWL: AM_2018_12_04_03B. Collected with mist nets; 4 adult ♀.

Identification. Easily distinguished from other vespers by the rich yellow ventral fur and long, narrow tragus. It was separated from the smaller species *S. viridis* by non-overlapping cranial measurements.

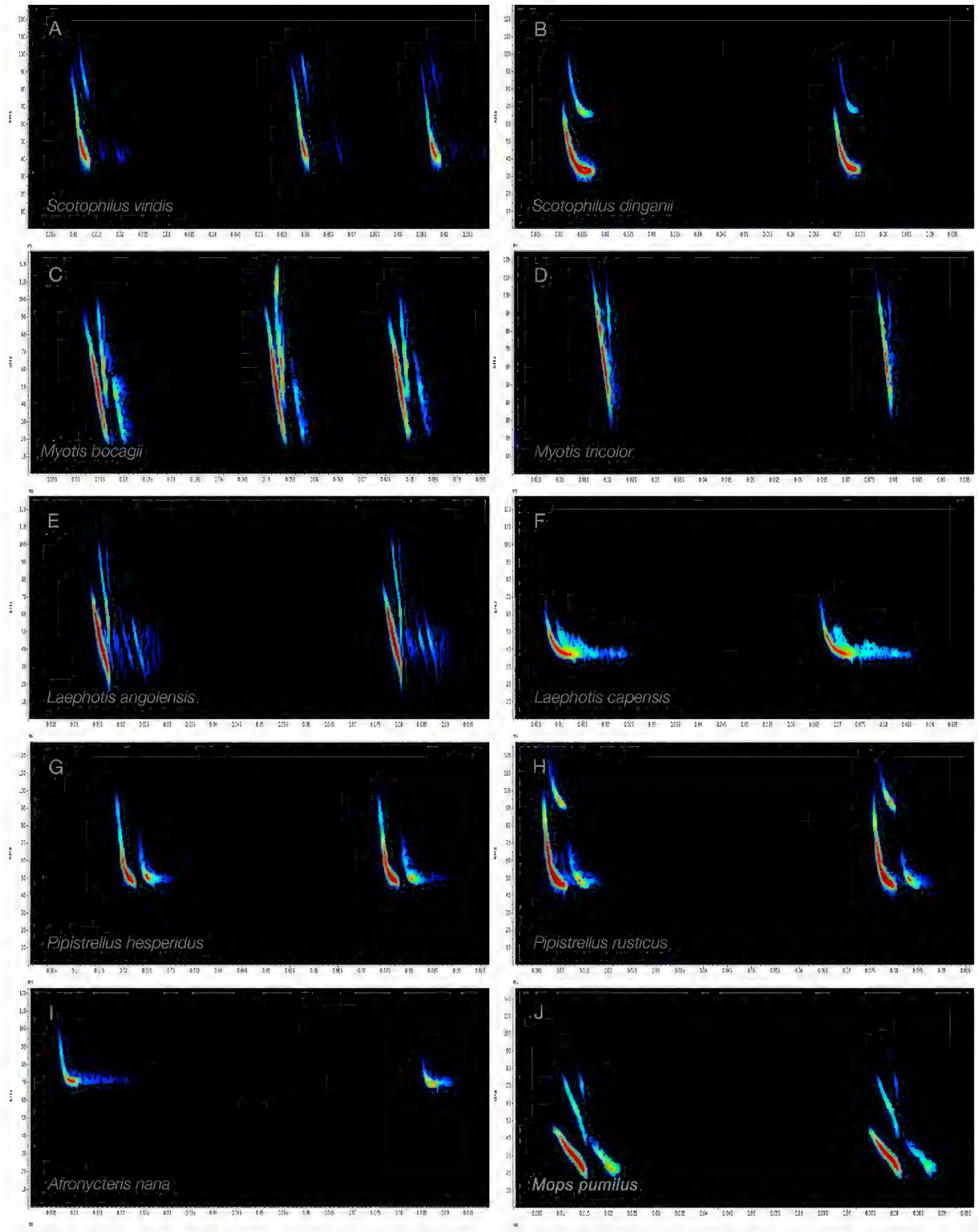

Figure 8. Chiroptera species from the families Vespertilionidae and Molossidae, echolocation recordings from Chimanimani National Park, Mozambique **A.** *Scotophilus viridis* **B.** *Scotophilus dinganii* **C.** *Myotis bocagii* **D.** *Myotis tricolor* **E.** *Laephotis angolensis* **F.** *Laephotis capensis* **G.** *Pipistrellus hesperidus* **H.** *Pipistrellus rusticus* **I.** *Afronycteris nana* **J.** *Mops pumilus.*

Biology and distribution. This species was only captured at Ndzou in forest at about 600 m above sea level. Three released individuals had peak frequencies of 34-35 kHz (Figure 8B).

***Scotophilus viridis* (Peters, 1852)**
Figures 6E, F, 8A

Material examined. Manica Province • Nhahomba; −19.06044, 033.0754; 654 m a.s.l.; EOWL: AM_2018_12_02_01B. Collected with mist nets; 3 adult ♀, 1 adult ♂.

Identification. Distinguished from other vesper bat species by having a rich medium-yellow ventral pelage, with a long and narrow tragus. It is smaller than *S. dinganii*, with non-overlapping forearm and skull measurements (Monadjem et al. 2020a).

Biology and distribution. This species was captured at Ndzou in forest at about 600 m above sea level, and at Nhabomba in riparian forest. Two released individuals had peak frequencies of 44–47 kHz (Figure 8A).

Order Rodentia
Family Gliridae

***Graphiurus* cf. *murinus* (Desmarest, 1822)**
Figure 9B

Material examined. Manica Province • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL:

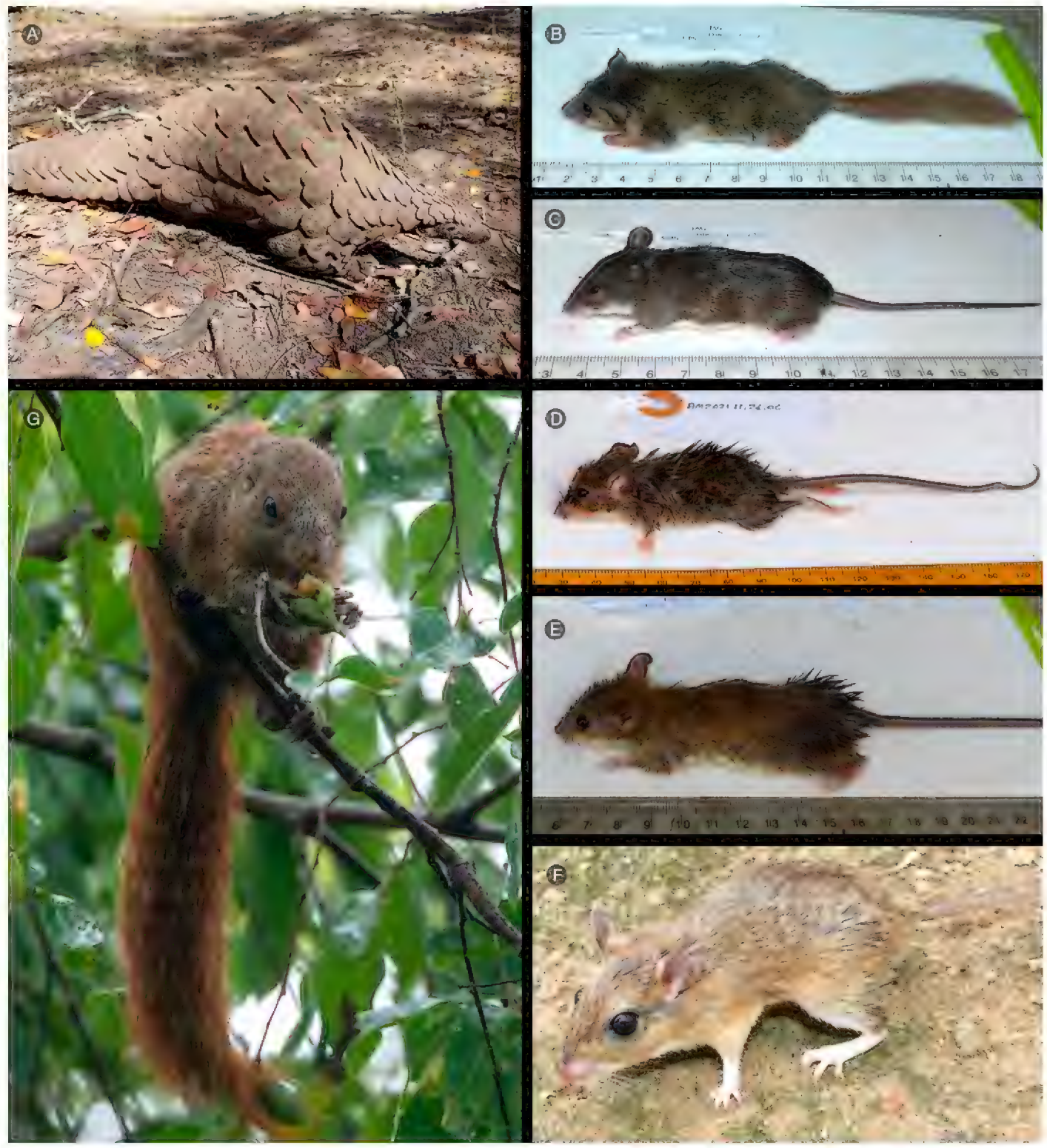

Figure 9. Mammal species from the order Pholidota and Rodentia recorded from Chimanimani National Park, Mozambique **A.** *Smutsia temminckii* **B.** *Graphiurus* cf *murinus* **C.** *Uranomys ruddi* **D.** *Dendromus mesomelas* **E.** *Grammomys cometes* **F.** *Gerbilliscus leucogaster* **G.** *Heliosciurus mutabilis.*

AM_2018_12_05_04R. Collected with Sherman traps; 1 adult ♂.

Identification. The taxonomy of the *G. murinus* complex is in need of revision, since this name perhaps refers to half a dozen or more distinct species (Krásová et al. 2021).

Biology and distribution. A single specimen was captured at Ndzou in lowland rainforest 600 m above sea level. The entire species complex appears to be associated with montane and temperate regions in Sub-Saharan Africa (Monadjem et al. 2015).

Family Muridae

Acomys spinosissimus Peters, 1852

Figure 10F

Material examined. Manica Province • Nhabawa; −19.07022, 033.0264; 737 m a.s.l.; EOWL: AGC008; Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC056; Nhahomba; −19.05873, 033.0858; 600 m a.s.l.; EOWL: AGC0140; Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_05_02R. Collected with Sherman traps; 5 adult ♂, 5 adult ♀.

Identification. *Acomys spinosissimus* represents a species complex, with at least three species occurring in Mozambique; *A. selousi* in the south, *A. ngurui* to the north of the Zambezi-Shire rivers, and populations from Chimanimani referring to *A. spinosissimus* s.s. (Petruzela et al. 2018). At present, these three species can only be distinguished genetically (Monadjem et al. 2015; Petruzela et al. 2018).

Biology and distribution. This species is associated with broken terrain within savanna, often in and around rocky outcrops. It is one of the most frequently captured murid rodents in Chimanimani NP from the lowest foothills to about mid-elevation between 500 m and 1,200 m above sea level.

Figure 10. Rodent species from the family Muridae recorded from Chimanimani National Park, Mozambique **A.** *Micaelamys namaquensis* **B.** *Lemniscomys rosalia* **C.** *Mastomys natalensis* **D.** *Rhabdomys dilectus* **E.** *Aethomys chrysophilus* **F.** *Acomys spinosissimus.*

***Aethomys chrysophilus* (De Winton, 1897)**
Figure 10E

Material examined. Manica Province • Nhabawa; −19.07022, 033.0264; 737 m a.s.l.; EOWL: AGC011; Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC065; Nhahomba; −19.05841, 033.0858; 570 m a.s.l.; EOWL: AM_2018_11_30_07R; Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_7R. Collected with Sherman traps; 1 adult ♀.

Identification. Distinguished from other murid species by having a reddish-brown dorsal pelage with off-white ventral pelage, a long tail (ca. 120% of head-body (HB) length), and strongly opisthodont incisors. Females have four pairs of nipples. Specimen AGC065 was sequenced for Cytb and matched with *Aethomys chrysophilus* (Appendix 3).

Biology and distribution. This species is closely associated with riverine and miombo woodland habitats within Chimanimani NP, occurring in the low foothills of the mountains at 500 m to 700 m above sea level.

***Gerbilliscus leucogaster* (Peters, 1852)**
Figure 9F

Material examined. Manica Province • Nhabawa; −19.07022, 033.0264; 737 m a.s.l.; EOWL: AGC040; Nhahomba; −19.05892, 033.0833; 624 m a.s.l.; EOWL: AM_2018_12_01_01R. Collected with Sherman traps; 1 adult ♂, 1 adult ♀.

Identification. *Gerbilliscus* is distinguished from other murid genera by a long hindfoot length and a relatively long tail (ca. 120% of HB), with *G. leucogaster* having a black dorsal line running along its length. Females have four pairs of nipples.

Biology and distribution. This species is closely associated with sandy soils, often in alluvial habitats, but is flexible with respect to other factors, and occurs in the foothills of the mountains between 600 m and 700 m above sea level.

***Grammomys cometes* (Thomas & Wroughton, 1908)**
Figure 9E

Material examined. Manica Province • Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC065; Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_06_01R. Collected with Sherman traps; 1 adult ♀.

Identification. Distinguished from other murid species by having a very long tail (ca. 160% of HB), and pure white ventral pelage. A thin band of orange is frequently present on the flanks in *G. cometes*. Females have three pairs of nipples. This species was sequenced and matched *G. cometes*.

Biology and distribution. This species is associated with a variety of forests and woodland habitats, particularly in thick vegetation and rocky outcrops within Chimanimani Mountains and occurs from the lowest foothills of the mountains up to 1,200 m above sea level.

***Lemniscomys rosalia* (Thomas, 1904)**
Figure 10B

Material examined. Manica Province • Nhahomba; −19.05873, 033.0858; 600 m a.s.l.; EOWL: AGC0137. Collected with Sherman traps; 2 adult ♂, 1 adult ♀.

Identification. Readily distinguished from other murid species in the field by a single dark mid-dorsal stripe.

Biology and distribution. This species is associated with miombo woodland habitats within Chimanimani NP and was only recorded at lower elevations at around 600 m above sea level.

***Mastomys natalensis* (Smith, 1834)**
Figure 10C

Material examined. Manica Province • Nhabawa; −19.07022, 033.0264; 737 m a.s.l.; EOWL: AGC009; Nhahomba; −19.05826, 033.0879; 570 m a.s.l.; EOWL: AM_2018_11_28_03R; Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_05_01R. Collected with Tomahawk traps; 3 adult ♂, 2 adult ♀.

Identification. Only distinguishable from other *Mastomys* species based on genetics. Females have 9–12 equally spaced pairs of nipples. Specimen AGC009 was sequenced for Cytb and matched with *M. natalensis* (Appendix 3).

Biology and distribution. This species was recorded in a variety of habitats including riparian forest, open savanna, and woodland. It was frequently captured at lower elevations between 500 m and 700 m above sea level.

***Micaelamys namaquensis* (Smith, 1834)**
Figure 10A

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; EOWL: AM_2021_11_25_01; Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC050. Collected with glue traps; 5 adult ♂, 2 adult ♀.

Identification. *Micaelamys* is distinguishable from other murid genera by a relatively long tail (ca. 140% of HB) with a pure white ventral pelage. Females have three pairs of nipples.

Biology and distribution. This species is typically associated with rocky outcrops and in Chimanimani NP was only recorded at higher elevations between 1,200 m and 1,600 m above sea level.

***Mus minutoides* Smith, 1834**
Figure 11B

Material examined. Manica Province • Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC047; Nhahomba; −19.05858, 033.0868; 604 m a.s.l.; EOWL: AM_2018_11_28_02R. Collected with Sherman traps; 1 adult ♂, 2 adult ♀.

Identification. The genus *Mus* is readily distinguishable by its diminutive size, short tail, and a pure white ventral pelage, and *Mus minutoides* is the only species occurring in this region (Monadjem et al. 2015).

Biology and distribution. This species is typically associated with savanna and grassland habitats in Chimanimani NP and was recorded from the foothills to mid-elevations between 600 m and 1,200 m above sea level.

***Rhabdomys dilectus* (De Winton, 1897)**
Figure 10D

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; EOWL: AM_2021_11_25_02; AM_2021_11_27_03. Collected with Sherman traps; 2 adult ♂, 2 adult ♀.

Identification. This genus is readily distinguishable by the four longitudinal dorsal black stripes against a tawny background colour, with a dirty white ventral pelage. The females typically have four pairs of nipples. Distinguished from other *Rhabdomys* species based on genetics (Appendix 4).

Biology and distribution. This species is associated with montane and submontane grasslands and in Chimanimani NP occurs at elevations above ca. 1,600 m above sea level. This species occurs from northern South Africa through Zimbabwe, Malawi to East Africa (Monadjem et al. 2015).

***Uranomys ruddi* Dollman, 1909**
Figure 9C

Material examined. MANICA PROVINCE • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_05_03R. Collected with Sherman traps; 1 adult ♂.

Identification. This monotypic genus is distinguishable from other murids by its small size, short tail, with brush-like dorsal hairs, and grooved upper incisors.

Biology and distribution. A single specimen was captured in forested habitat. It is an infrequently captured species in southern Africa, with most records south of the Zambezi River being from the border between Zimbabwe and Mozambique (Monadjem et al. 2015).

Family Nesomyidae

***Cricetomys ansorgei* Thomas, 1904**
Figure 11A

Material examined. MANICA PROVINCE • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_6R. Collected with Tomahawk traps; 1 adult ♀.

Identification. *Cricetomys* spp. are the largest murid rodents in the region, with a greyish dorsal pelage that is coarse with long hairs without a clear demarcation of flanks from ventral pelage. *Cricetomys ansorgei* is the only species occurring in southern Africa (Monadjem et al. 2015).

Biology and distribution. This species is associated lowland rainforest and thicket habitats within Chimanimani NP at around 600 m above sea level.

***Dendromus mesomelas* (Brants, 1827)**
Figure 9D

Material examined. MANICA PROVINCE • Mambo; −19.07605, 033.0892; 1,682 m a.s.l.; EOWL: AM_2021_11_26_06. Collected with pitfall traps; 1 adult ♂, 1 adult ♀.

Identification. *Dendromus* spp. are readily distinguishable by their small size, very long and prehensile tail, and reduced digits 1 and 5 of the forefoot. *D. mesomelas* has a mid-dorsal stripe extending from the back of the head to the rump, with a pure white ventral pelage; and it is the largest of the southern African species (Monadjem et al. 2015).

Biology and distribution. Two individuals were captured in montane grassland at 1,600 m above sea level.

Family Hystricidae

***Hystrix africaeaustralis* Peters, 1852**

Material examined. MANICA PROVINCE • Mambo; −19.07631, 033.0902; 1,659 m a.s.l. Captured on a camera trap.

Identification. Identified by a quill found on the ground and from camera trap footage.

Biology and distribution. This species was recorded in a boggy grassland along a stream at 1,600 m above sea level within Chimanimani NP.

Family Sciuridae

***Heliosciurus mutabilis* (Peters, 1852)**
Figure 9G

Material examined. MANICA PROVINCE • Nhahomba; −19.05873, 033.0858; 600 m a.s.l. Several individuals observed.

Identification. This species is the only *Heliosciurus* occurring in the region (Monadjem et al. 2015) and is easily identified on external features.

Figure 11. Rodent (Rodentia) and shrew (Eulipotyphla) species from the families Nesomyidae, Muridae, and Soricidae recorded from Chimanimani National Park, Mozambique **A.** *Cricetomys ansorgei* **B.** *Mus minutoides* **C.** *Myosorex meesteri* **D.** *Crocidura cyanea* **E.** *Crocidura olivieri.*

Biology and distribution. This species was frequently encountered in riparian forest at lower elevations around 600 to 800 m above sea level.

Order Lagomorpha
Family Leporidae

***Lepus victoriae* Thomas, 1893**
Figure 12F

Material examined. Manica Province • Nhahomba; −19.05873, 033.0858; 600 m a.s.l. Captured on a camera trap.

Identification. This species is assumed to be the only *Lepus* species occurring in the region (Smithers and Wilson 1979), but *Lepus capensis* cannot be discounted from this photograph (Figure 12F).

Biology and distribution. This species is associated with savanna habitats and generally lives in a variety of grassland and open habitats.

***Pronolagus randensis* Jameson, 1907**
Figure 12G

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; Binga; −19.07134, 32.9956; 965 m a.s.l. Captured on a camera trap.

Identification. Recorded based on observations of individuals, and their characteristic faeces (see Fig 12G), which may accumulate in large piles.

Biology and distribution. This species is associated with rocky outcrop habitats and generally recorded at higher elevations, e.g. 1,600 m above sea level and above.

Figure 12. Mammal species from the order Carnivora and Lagomorpha recorded from Chimanimani National Park, Mozambique **A.** *Aonyx capensis* **B.** *Atilax paludinosus* **C.** *Bdeogale crassicauda* **D.** *Galerella sanguinea* **E.** *Ichneumia albicauda* **F.** *Lepus victoriae* **G.** *Pronolagus randensis.*

Order Primates
Family Cercopithecidae

***Cercopithecus mitis* Wolf, 1822**
Figure 13C

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Binga; −19.07113, 033.0024; 880 m a.s.l. Captured on a camera trap.

Identification. Readily distinguishable from *Chlorocebus pygerythrus* (which we did not record in this study) on external features.

Biology and distribution. This species was frequently recorded in forest patches at 800 m above sea level and above in Chimanimani NP.

***Papio ursinus* (Kerr, 1792)**
Figure 13B

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; Binga; −19.07113, 033.0024; 880 m a.s.l. Captured on a camera trap.

Identification. This species is the only member of the genus *Papio* occurring south of the Zambezi River and is readily identifiable on external features (Skinner and Chimimba 2005).

Biology and distribution. This species occurs in a variety of habitats from the foothills to the high mountains from about 700 m above sea level and above.

Family Galagidae

***Otolemur crassicaudatus* (É. Saint-Geoffroy, 1812)**

Material examined. Manica Province • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; Chikukwa; −19.07122, 32.9902; 1,037 m a.s.l.; Binga; −19.07134, 32.9956; 965 m a.s.l. Recorded by call.

Identification. Identified by its characteristic call.

Biology and distribution. This species is associated with a variety of forest types, occurring widely in appropriate habitat from about 600 m to over 1,000 m above sea level.

***Paragalago granti* (Thomas & Wroughton, 1907)**
Figure 13A

Material examined. Manica Province • Mambo; −19.07134, 32.9956; 965 m a.s.l. Recorded by call.

Identification. Identified by its characteristic call and captured on a camera trap.

Biology and distribution. Little is known about this elusive animal in Chimanimani NP, which we only recorded in forested environments.

Order Eulipotyphla
Family Soricidae

***Crocidura olivieri* (Lesson, 1827)**
Figure 11E

Material examined. Manica Province • Ndzou; −19.07334, 033.3381; 635 m a.s.l.; EOWL: AM_2018_12_05_01S; Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; EOWL: AM_2021_11_26_02. Collected in pitfall traps; 2 adult ♂, 1 adult ♀.

Identification. In Mozambique south of the Zambezi, this species is readily identifiable by its large size (Skinner and Chimimba, 2005).

Biology and distribution. In Chimanimani NP, this species occurs in a variety of habitats including lowland rainforest and montane grasslands from 600 m to 1,600 m above sea level.

***Crocidura cyanea* (Duvernoy, 1838)**
Figure 11D

Material examined. Manica Province • Mambo; −19.07605, 033.0892; 1,682 m a.s.l.; EOWL: AM_2021_11_27_06; Binga; −19.07500, 033.0567; 1,215 m a.s.l.; EOWL: AGC052, AGC052. Collected in pitfall traps; 3 adults.

Identification. Identified by its skull, dentition, and genetics. Two specimens were sequenced and matched *Crocidura cyanea* (Appendix 5).

Biology and distribution. This species was only recorded at high elevations in Chimanimani NP at around 1,600 m above sea level.

***Myosorex meesteri* Taylor et al., 2013**
Figure 11C

Material examined. Manica Province • Mambo; −19.07605, 033.0892; 1,682 m a.s.l.; EOWL: AM_2021_11_26_08. Collected in pitfall traps; 3 adult ♂, 7 adult ♀.

Identification. This is the only species of *Myosorex* occurring in the central Mozambique highlands (Taylor et al. 2013) and was identified by its characteristic dentition and skull (Skinner and Chimimba 2005).

Biology and distribution. In Chimanimani NP, this species was only recorded in montane grasslands and forest habitats at elevations above about 1,500 m above sea level.

Order Pholidota
Family Manidae

***Smutsia temminckii* (Smuts, 1832)**
Figure 9A

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Binga; −19.07113, 033.0033; 866 m a.s.l. Photographed.

Identification. This is the only species of pangolin that occurs in southern Africa (Skinner and Chimimba 2005) and is readily identifiable by the overlapping scales covering its body.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

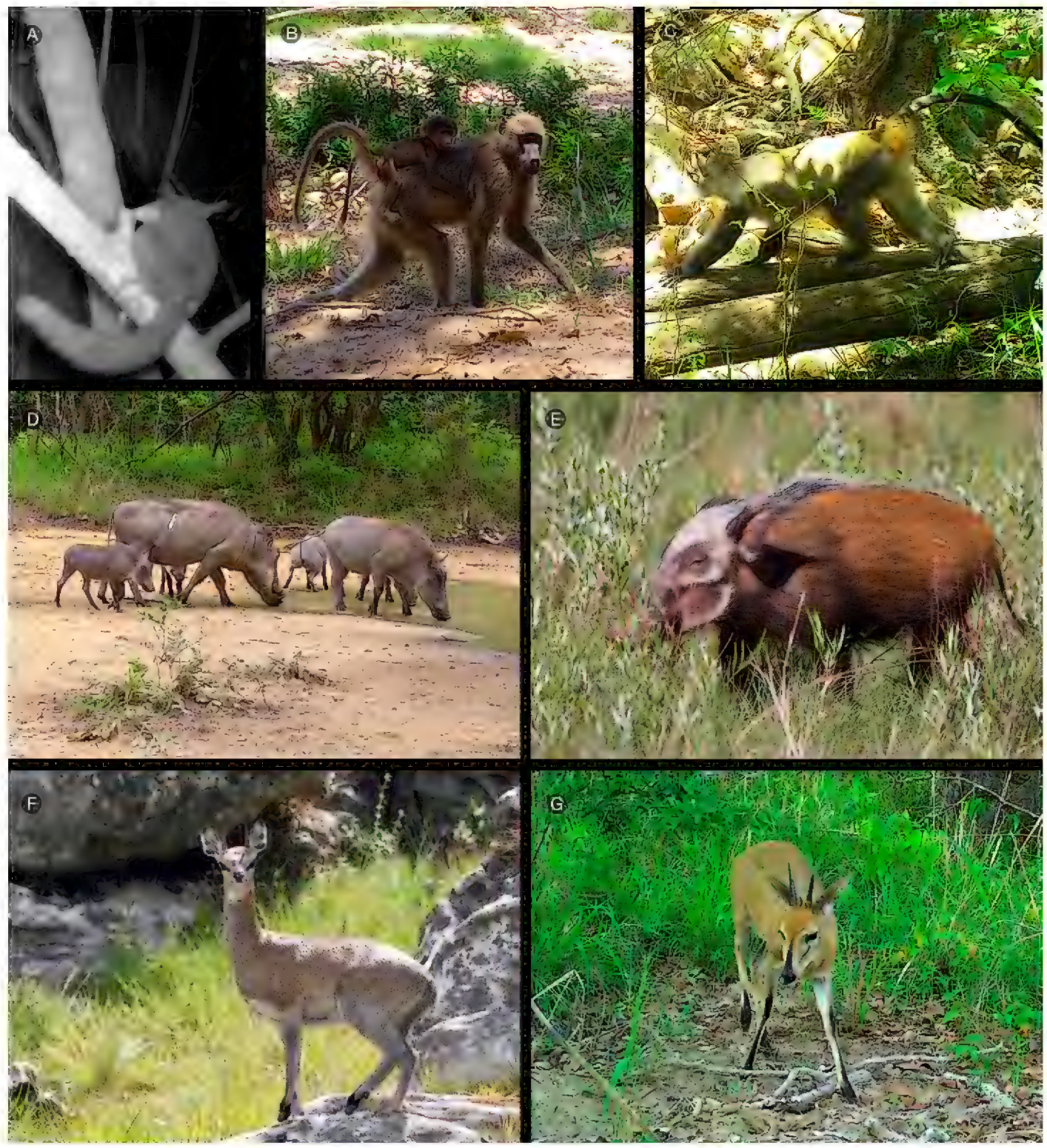

Figure 13. Mammal species from order Primates and Cetartiodactyla recorded from Chimanimani National Park, Mozambique **A.** *Paragalago granti* **B.** *Papio ursinus* **C.** *Cercopithecus mitis* **D.** *Phacochoerus africanus* **E.** *Potamochoerus larvatus* **F.** *Oreotragus oreotragus* **G.** *Sylvicapra grimmia.*

Order Carnivora
Family Canidae

***Canis adustus* (Sundevall, 1847)**
Figure 14A

Material examined. Manica Province • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Binga; −19.07113, 033.0033; 866 m a.s.l. Captured on camera trap.

Identification. Readily identifiable on external features, including a dark tail that is almost always tipped with white.

Biology and distribution. This species was frequently seen in open habitats at 800 m to 1,600 m above sea level.

Family Hyaenidae

***Crocuta crocuta* (Erxleben, 1777)**
Figure 14B

Material examined. Manica Province • Chikukwa, −19.06303, 033.0651; 700 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. This species was frequently seen in open Miombo woodland habitat at 500 m to 1,000 m above sea level.

Figure 14. Carnivore species from the families Canidae, Hyaenidae, Felidae, and Viverridae recorded from Chimanimani National Park, Mozambique **A.** *Canis adustus* **B.** *Crocuta crocuta* **C.** *Leptailurus serval* **D.** *Genetta maculata* **E.** *Nandinia binotata* **F.** *Civettictis civetta.*

Family Felidae

***Leptailurus serval* (Schreber, 1776)**
Figure 14C

Material examined. Manica Province • Mambo; −19.07564, 033.0821; 1,800 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. This species is typically associated with open savanna and grassland habitats, but in Chimanimani NP it was photographed at the edge of a forest.

Family Herpestidae

***Atilax paludinosus* Cuvier, 1829**
Figure 12B

Material examined. Manica Province • Nhahomba; −19.05858, 033.0868; 604 m a.s.l.; Mambo; −19.07631, 033.0902; 1,659 m a.s.l. Captured on camera trap.

Identification. Readily identifiable on external features and spoor.

Biology and distribution. Tracks were seen along streams in savanna and montane forest from 600 m to 1,600 m above sea level.

***Bdeogale crassicauda* Peters, 1852**
Figure 12C

Material examined. Manica Province • Binga; −19.07113, 033.0033; 866 m a.s.l.; Ndzou; −19.07334, 033.3381; 635 m a.s.l. Captured on camera trap.

Figure 15. Mammal species from the order Cetartiodactyla and Proboscidea recorded from Chimanimani National Park, Mozambique **A.** *Redunca arundinum* **B.** *Kobus ellipsiprymnus* **C.** *Hippotragus niger* **D.** *Taurotragus oryx* **E.** *Tragelaphus scriptus* **F.** *Loxodonta africana.*

Identification. Readily identifiable by its dark, bushy tail and short, dark limbs.

Biology and distribution. This species was captured on camera traps in rainforest at 600 m above sea level, and in woodland at 1,000 m above sea level.

***Galerella sanguinea* (Rüppell, 1835)**
Figure 12D

Material examined. Manica Province • Binga; −19.07113, 033.0024; 880 m a.s.l. Captured on camera trap.

Identification. Readily identifiable by its dark tipped, slender tail.

Biology and distribution. This species typically occurs in a wide range of habitats, but it was only recorded once during this survey and therefore little is known about its ecology in Chimanimani NP.

***Ichneumia albicauda* (Cuvier, 1829)**
Figure 12E

Material examined. Manica Province • Chikukwa, −19.06656, 033.0865; 850 m a.s.l. Captured on camera trap.

Identification. Readily identifiable by its large, fluffy, white tail.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

Family Viverridae

***Genetta maculata* (Gray, 1830)**
Figure 14D

Material examined. Manica Province • Nhahomba; −19.05858, 033.0868; 604 m a.s.l.; Binga; −19.07509, 033.0566; 1,233 m a.s.l. Captured on camera trap.

Identification. Identified by the dark tip on its tail.

Biology and distribution. This species was captured infrequently on camera traps in a variety of forest, woodland, and savanna habitats between 600 m and 1,200 m above sea level.

***Civettictis civetta* (Schreber, 1776)**
Figure 14F

Material examined. MANICA PROVINCE • Chikukwa, −19.06604, 033.0499; 600 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

***Nandinia binotata* (Gray, 1830)**
Figure 14E

Material examined. MANICA PROVINCE • Chikukwa, −19.07111, 033.0024, 850 m a.s.l., Captured on camera trap.

Identification. Identified by its characteristically short limbs and woolly, non-tapering tail.

Biology and distribution. This species is associated with forest habitats, but virtually nothing is known about its biology in Chimanimani NP.

Family Mustelidae

***Aonyx capensis* (Schinz, 1821)**
Figure 12A

Material examined. MANICA PROVINCE • Binga; −19.07134, 32.9956; 965 m a.s.l. Captured on camera trap.

Identification. Readily identifiable on external features, and its spoor does not show any signs of claws.

Biology and distribution. This species always occurs in or adjacent to rivers, where it forages for crabs and fish. In Chimanimani NP, it was only recorded around 1,000 m above sea level, but presumably has been overlooked elsewhere in suitable habitat.

Order Cetartiodactyla
Family Suidae

***Potamochoerus larvatus* (Cuvier, 1822)**
Figure 13E

Material examined. MANICA PROVINCE • Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; Binga; −19.07113, 033.0033; 866 m a.s.l. Captured on camera trap.

Identification. Readily identifiable on external features.

Biology and distribution. This species was only recorded at two locations during this survey between 700 m and 1,200 m above sea level but is presumed to occur more widely here.

***Phacochoerus africanus* (Gmelin, 1788)**
Figure 13D

Material examined. MANICA PROVINCE • Chikukwa, −19.06604, 033.0499; 600 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. This species only occurs in savanna habitats at lower elevations in Chimanimani NP.

Family Bovidae

***Oreotragus oreotragus* (Zimmermann, 1783)**
Figure 13F

Material examined. MANICA PROVINCE • Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Chikukwa; −19.07122, 32.9902; 1,037 m a.s.l.; Binga; −19.07134, 32.9956; 965 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. This species was seen relatively frequently in steep rocky terrain above 900 m

above sea level.

***Redunca arundinum* (Boddaert, 1785)**
Figure 15A

Material examined. Manica Province • Nhabawa; −19.07063, 033.0245; 713 m a.s.l. Captured on camera trap.

Identification. Readily identifiable by the dark line on the forelimbs.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

***Sylvicapra grimmia* (Linnaeus, 1758)**
Figure 13G

Material examined. Manica Province • Nhahomba; −19.05858, 033.0868; 604 m a.s.l.; Mambo; −19.07631, 033.0902; 1,659 m a.s.l.; Nhabawa; −19.07063, 033.0245; 713 m a.s.l.; Binga; −19.07113, 033.0024; 880 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. This species was observed widely in Chimanimani NP from 600 m to 1,600 m above sea level.

***Tragelaphus scriptus* (Pallas, 1766)**
Figure 15E

Material examined. Manica Province • Binga; −19.07113, 033.0033; 866 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. In Chimanimani NP, this species was only recorded at mid-elevation in thick woodland.

***Hippotragus niger* (Harris, 1838)**

Figure 15C

Material examined. Nhahomba; −19.05858, 033.0868; 604 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. Several herds roam the lower foothills of the mountain.

***Kobus ellipsiprymnus* (Ogilby, 1833)**
Figure 15B

Material examined. Nhahomba; −19.05858, 033.0868; 604 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

***Taurotragus oryx* (Pallas, 1766)**
Figure 15D

Material examined. Nhahomba; −19.05858, 033.0868; 604 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. Little is known about the ecology of this species in Chimanimani NP.

Order Proboscidea
Family Elephantidae

***Loxodonta africana* (Blumenbach, 1797)**
Figure 15F

Material examined. Ndzou; −19.07334, 033.3381; 635 m a.s.l. Captured on camera trap.

Identification. Readily identifiable based on external features.

Biology and distribution. An estimated 120 elephants roam the lower slopes of Chimanimani NP, with some movement into communal lands adjacent to the park.

DISCUSSION

Since 2016, we have conducted five biodiversity surveys on the Mozambican side of the Chimanimani Mountains, within the Chimanimani NP. Our results show that this region harbours a diverse mammalian fauna, comprising at least 69 species. Forty-one of these species were small mammals, including 23 species of bats (Chiroptera), 15 rodents (Rodentia), and three shrews (Eulipotyphla). The remaining mammal species that we recorded in Chimanimani NP included 11 species of carnivores (Carnivora), nine antelopes/pigs (Cetartiodactyla), four Primates, two species of hare (Lagomorpha), one pangolin species (Pholidota), and one species of elephant (Proboscidea). It is worth noting that there were some species that could not be identified to species level and potentially represent species not reported in this paper. Furthermore, there are several species that we suspected we observed during the surveys, but whose identifications we could not confirm definitively. These include burrows of what we identified as belonging to aardvarks (*Orycteropus afer* (Pallas, 1766)), and spoor that we suspected as belonging to a leopard (*Panthera pardus* (L., 1758)). It is also highly likely that we overlooked many smaller, more cryptic species, such as rodents, bats, and shrews, and elusive species such as meso-carnivores. The true diversity of mammals in these mountains is therefore no doubt greater than what we have presented here.

Bats dominated the number of small mammal species recorded on the Mozambican side of the Chimanimani Mountains, which is a trend observed in other forest ecosystems in Africa (Monadjem and Fahr 2007; Weber et al. 2019; Monadjem et al. 2024). Lowland tropical regions of Africa typically support double the number of bats compared with rodent species, but these two groups have different responses to elevation; bat diversity tends to decrease with increase in elevation, whereas rodents show highest diversity at mid-elevations (Monadjem et al. 2024). Rodent diversity reaches its peak in Africa between 1,000 m and 2,000 m above sea level, whereas at these elevations, the number of bat species has already greatly reduced, especially in savanna habitats (Weier et al. 2017). In our study, we captured most of the bat species at lower elevations, whereas the opposite was true for rodents and shrews, neatly fitting with the continental patterns described above.

Based on the results of our surveys, we have documented and filled a knowledge gap of the mammals of a relatively understudied yet important and biodiverse area of Mozambique. Moreover, our results have contributed to documenting and understanding the mammalian fauna of a transboundary conservation area. For example, surveys done on the Zimbabwean side have documented sightings of elephants and sable antelopes (Ghiurghi et al. 2010), which were also recorded in our surveys, illustrating the transboundary importance of these mountains for protecting wildlife. Furthermore, our study has improved our knowledge on the distribution of Mozambique's small, medium, and large mammalian fauna. For example, several species of small mammals recorded in our surveys are poorly known in Mozambique, such as the rodent *Uranomys ruddi*, and the bats *Rhinolophus deckenii*, *R. smithersi*, and *Pipistrellus rusticus* (Monadjem et al. 2010; Neves et al. 2018), and some were only recently described, such as the bat *Miniopterus wilsoni*, which was originally discovered on Mount Gorongosa, approximately 180 km to the northeast of the courntry (Monadjem et al. 2020b).

The mammal community of the Chimanimani Mountains was comprised mainly of savanna and grassland species, with a few montane species also recorded. Our study captured the elevational and habitat diversity within the Chimanimani Mountains, and this was reflected by the change in species composition from savanna and woodland habitats at lower elevations, to montane grasslands and forest at higher elevations. Our surveys covered an extensive elevational gradient of the Chimanimani Mountains, allowing us to compare species composition at the low elevation sites of Ndzou and Nhahomba, with the higher elevation sites of Binga and Mambo. Shrew diversity and abundance peaked in the montane grasslands and forests, whereas the opposite trend was shown by bats, which declined in diversity at higher elevations, corroborating trends across the continent (Monadjem et al. 2024). In contrast, rodent diversity did not obviously change across the elevational gradient.

We recorded several threatened species, including one Endangered species (*Loxodonta africana*), one Vulnerable species (*Smutsia temminckii*), and three Near Threatened species (*Rhinolophus deckenii*, *Rhinolophus smithersi*, and *Aonyx capensis*) (IUCN 2024). This demonstrates the importance of the Chimanimani Mountains for the conservation of threatened mammals in Mozambique, and southern Africa generally.

Our multiple surveys of these mountains have significantly contributed to understanding and documenting Mozambique's biodiversity. This paper is the first to present a checklist for the mammals of Mozambique's Chimanimani National Park. Our results demonstrate that the Chimanimani Mountains support a diverse mammalian community, including several threatened species, highlighting the importance of the area for targeted conservation.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

Ethical statement. We handled all captured mammals in accordance with the guidelines of the American Society of Mammalogy for the ethical and safe treatment of mammals (Sikes 2016). We were granted permission by the Chimanimani National Park to handle all captured animals and collect voucher specimens for final species identifications.

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Author contributions

Conceptualization: AM, PN; Data curation: AM, PN; Formal analysis: AM, PN, MLM, Funding acquisition: PN; Investigation: MLM, AGC, PN, AN, AM; Methodology: AM, PN, DD FV, IMR; Resources: PN, AM; Supervision: AM; Project administration: AM, PN; Software: AM, PN, MLM; Validation: AM; Visualization: MLM, PN, AM, DD; Writing – original draft: MLM, AM; Writing – review and editing: all authors.

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Data availability

All data that support the findings of this study are available in the main textband Appendix.

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APPENDIX

Table A1. Reference mtDNA sequences obtained from the National Centre for Biotechnology Information (NCBI), and accession numbers for all cyt-b and COI sequences that have been deposited in GenBank for bats, rodents and shrews recorded in the Chimanimani National Park or comparative material in the phylogenies (see Appendix Figs. 1–5).

Species	Accession, reference no.	cyt b	COI	Reference
Vespertilionidae				
Laephotis namibensis	EU797438.1	Y		Trujillo et al. 2008
Laephotis wintoni	MT777969.1	Y		Monadjem et al. 2021b
Laephotis capensis	MT777878.1	Y		Monadjem et al. 2021b
Laephotis capensis	MT777873.1	Y		Monadjem et al. 2021b
Laephotis capensis	AM2010.12.01-05B	Y		This study
Laephotis capensis	AM2018.12.02-02B	Y		This study
Laephotis matroka	MT777897.1	Y		Monadjem et al. 2021b
Laephotis kirinyaga	MT777965.1	Y		Monadjem et al. 2021b
Laephotis malagasyensis	MT777896.1	Y		Monadjem et al. 2021b
Laephotis robertsi	MT777904.1	Y		Monadjem et al. 2021b
Neoromicia somalica	MT777907.1	Y		Monadjem et al. 2021b
Neoromicia zuluensis	MT777910.1	Y		Monadjem et al. 2021b
Pseudoromicia brunnea	MT777937.1	Y		Monadjem et al. 2021b
Pseudoromicia kityoi	MT777941.1	Y		Monadjem et al. 2021b
Pseudoromicia roseveari	MT777942.1	Y		Monadjem et al. 2021b
Nycticeinops cf. *crassulus*	MT777913.1	Y		Monadjem et al. 2021b
Nycticeinops grandidieri	MT777915.1	Y		Monadjem et al. 2021b
Nycticeinops happoldorum	MT777919.1	Y		Monadjem et al. 2021b
Nycticeinops schlieffeni	OQ111860.1	Y		Benda et al. 2022
Nycticeinops schlieffeni	AM2018.11.29-01B	Y		This study
Nycticeinops schlieffeni	OR105696.1	Y		Viljoen et al., unpublished
Vansonia cf. *rueppellii*	MT777948.1	Y		Monadjem et al. 2021b
Pipistrellus nanulus	MT777930.1	Y		Monadjem et al. 2021b
Pipistrellus nanulus	MT777933.1	Y		Monadjem et al. 2021b
Pipistrellus raceyi	KM886094.1	Y		Goodman et al. 2016
Pipistrellus rusticus	KX375167.1	Y		Benda et al. 2016
Pipistrellus hesperidus	MT777923.1	Y		Monadjem et al. 2021b
Pipistrellus hesperidus	MT777926.1	Y		Monadjem et al. 2021b
Pipistrellus hesperidus	MT777920.1	Y		Monadjem et al. 2021b
Pipistrellus hesperidus	MT777922.1	Y		Monadjem et al. 2021b
Pipistrellus hesperidus	AM2018.12.03-01B	Y		This study
Pipistrellus hesperidus	AM2018.12.05-02B	Y		This study
Miniopterus inflatus rufus	MN064735.1	Y		Lutz et al. 2019
Laephotis capensis	AM2018.11.29-05B		Y	This study
Laephotis capensis	JX508826.1		Y	Monadjem et al. 2013
Laephotis capensis	MF947523.1		Y	Geldenhuys et al. 2018
Laephotis capensis	MF947527.1		Y	Geldenhuys et al. 2018
Laephotis capensis	AM2018.11.29-08B		Y	This study
Laephotis botswanae	MF038572.1		Y	Geldenhuys et al. 2018
Laephotis angolensis	ON491729.1		Y	Taylor et al. 2022
Afronycteris nana	JX508829.1		Y	Monadjem et al. 2013
Hypsugo savii	OQ706647.1		Y	Ruedi et al. 2023
Nycticeinops bellieri	JX508834.1		Y	Monadjem et al. 2013
Nycticeinops schlieffeni	OR091287.1		Y	Viljoen et al., unpublished
Nycticeinops schlieffeni	AM2018.11.29-01B		Y	This study
Pseudoromicia roseveari	JX508827.1		Y	Monadjem et al. 2013
Neoromicia somalica	JX508830.1		Y	Monadjem et al. 2013
Pipistrellus nanulus	JX508837.1		Y	Monadjem et al. 2013
Pipistrellus rusticus	ON491807.1		Y	Taylor et al. 2022

Species	Accession, reference no.	cyt b	COI	Reference
Pipistrellus hesperidus	ON491807.5		Y	Taylor et al. 2022
Pipistrellus hesperidus	AM2018.12.03-01B		Y	This study
Scotoecus sp.	JF442682.1		Y	Agwanda and Kuzmin, unpublished
Scotoecus cf. *hindei*	AM2018.12.02.04B		Y	This study
Scotoecus cf. *hindei*	AM2018.12.02-03B		Y	This study
Scotoecus sp.	OR606613.1		Y	Rafael et al., unpublished
Mops pumilus	MF947529.1		Y	Geldenhuys et al. 2018
Scotophilus dinganii	MF947528.1		Y	Geldenhuys et al. 2018
Muridae				
Mastomys natalensis	AF518341.1	Y		Lecompte et al. 2002
Mastomys natalensis	AGC009	Y		This study
Mastomys huberti	AF518339.1	Y		Lecompte et al. 2002
Mastomys coucha	AF518334.1	Y		Lecompte et al. 2002
Mastomys erythroleucus	AF518336.1	Y		Lecompte et al. 2002
Praomys tullbergi	AF518365.1	Y		Lecompte et al. 2002
Praomys jacksoni	AF518361.1	Y		Lecompte et al. 2002
Stenocephalemys albocaudata	AF518369.1	Y		Lecompte et al. 2002
Aethomys hindei	MW537271.1	Y		Krasova et al. 2021
Aethomys bocagei	MW537105.1	Y		Krasova et al. 2021
Aethomys silindensis	MW537401.1	Y		Krasova et al. 2021
Aethomys kaiseri	MW537309.1	Y		Krasova et al. 2021
Aethomys chrysophilus	MW537141.1	Y		Krasova et al. 2021
Aethomys chrysophilus	AGC065	Y		
Rhabdomys intermedius	JQ003451.1		Y	du Toit et al. 2012
Rhabdomys intermedius	MT093550.1		Y	Ganem et al. 2020
Rhabdomys bechuanae	MT093522.1		Y	Ganem et al. 2020
Rhabdomys bechuanae	MT093526.1		Y	Ganem et al. 2020
Rhabdomys bechuanae	MT093553.1		Y	Ganem et al. 2020
Rhabdomys dilectus dilectus	MT093524.1		Y	Ganem et al. 2020
Rhabdomys dilectus dilectus	MT093518.1		Y	Ganem et al. 2020
Rhabdomys dilectus dilectus	MT093520.1		Y	Ganem et al. 2020
Rhabdomys dilectus dilectus	AM2018.11.25-02		Y	This study
Rhabdomys dilectus dilectus	JQ003434.1		Y	du Toit et al. 2012
Rhabdomys dilectus dilectus	AM2018.11.27.03		Y	This study
Rhabdomys dilectus dilectus	JQ003433.1		Y	du Toit et al. 2012
Rhabdomys dilectus chakae	MT093532.1		Y	Ganem et al. 2020
Rhabdomys dilectus chakae	MT093544.1		Y	Ganem et al. 2020
Rhabdomys dilectus chakae	MT093517.1		Y	Ganem et al. 2020
Rhabdomys dilectus chakae	MT093519.1		Y	Ganem et al. 2020
Rhabdomys dilectus chakae	JQ003459.1		Y	du Toit et al. 2012
Rhabdomys dilectus chakae	MT093516.1		Y	Ganem et al. 2020
Rhabdomys pumilio	MT093539.1		Y	Ganem et al. 2020
Rhabdomys pumilio	MT093551.1		Y	Ganem et al. 2020
Rhabdomys pumilio	MT093552.1		Y	Ganem et al. 2020
Rattus lutreolus	NC014858.1		Y	Robins et al. 2010
Apodemus peninsulae	HQ660074.1		Y	Oh et al. 2011
Myomyscus verreauxii	NC065081.1		Y	Nicolas et al. 2021
Praomys jacksoni	NC065083.1		Y	Nicolas et al. 2021
Soricidae				
Crocidura cyanea	AGC052	Y		This study
Crocidura cyanea	AGC062	Y		This study
Crocidura cyanea	OQ201159.1	Y		Dianat et al. 2021
Crocidura telfordi	KF110758.1	Y		Stanley et al. 2013
Crocidura stenocephala	KF110759.1	Y		Stanley et al. 2013

Species	Accession, reference no.	cyt b	COI	Reference
Crocidura maurisca	KF110760.1	Y		Stanley et al. 2013
Crocidura dolichura	KF110762.1	Y		Stanley et al. 2013
Crocidura flavescens	DQ305218.1	Y		Dubey et al. 2007
Crocidura olivieri	KF110757.1	Y		Stanley et al. 2013
Crocidura silacea	KF110763.1	Y		Stanley et al. 2013
Crocidura niobe	KF110761.1	Y		Stanley et al. 2013
Crocidura luna	OQ979398.1	Y		Dianat et al. 2024
Myosorex cafer	DQ630418.1	Y		Dubey et al. 2007
Myosorex varius	DQ630420.1	Y		Dubey et al. 2007

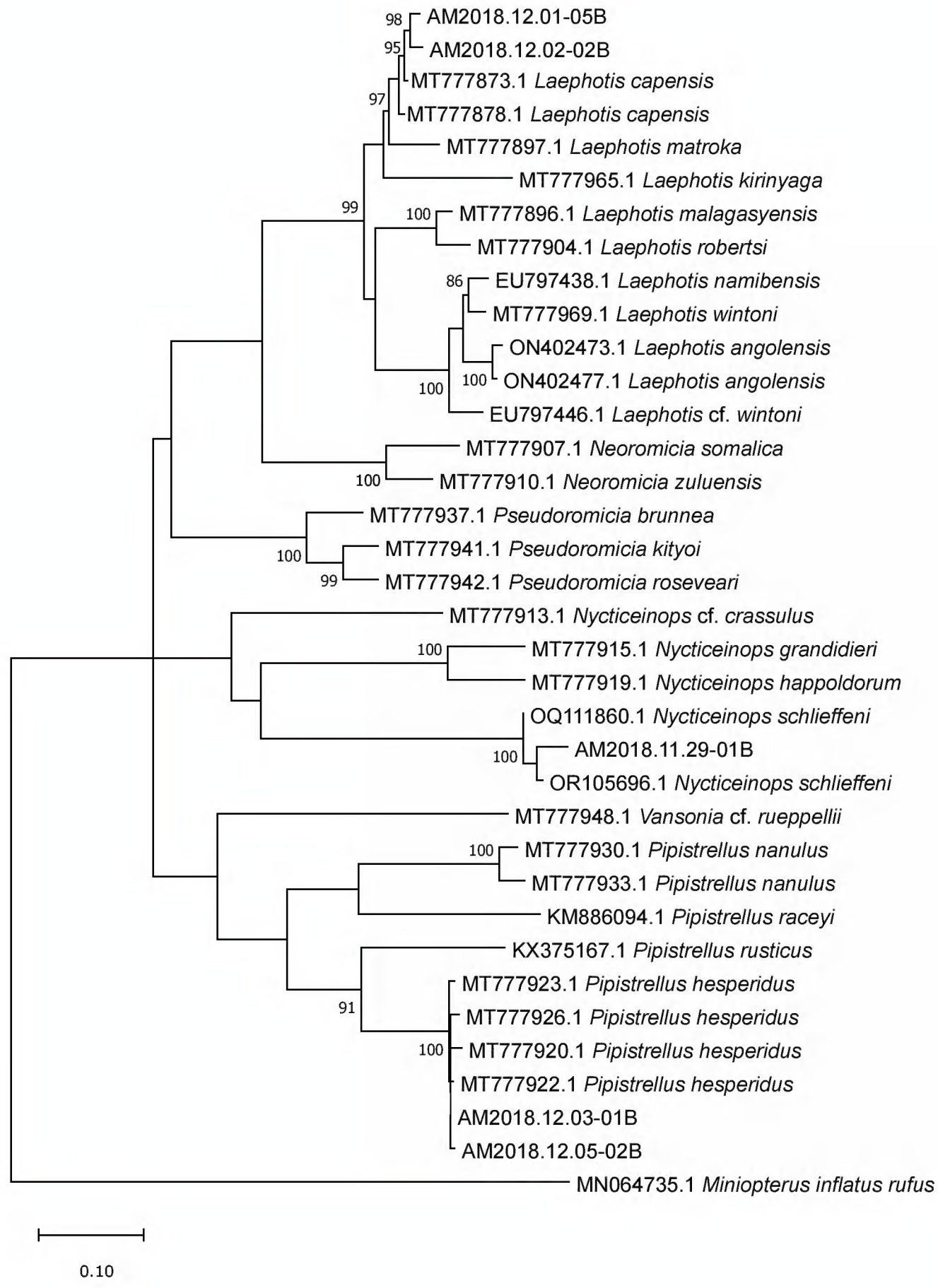

Figure A1. A phylogeny for three Vespertilionidae bat species captured at the Chimanimani National Park, Mozambique (*Laephotis capensis*, *Nycticeinops schlieffeni*, and *Pipistrellus hesperidus*) based on Cytb sequencing.

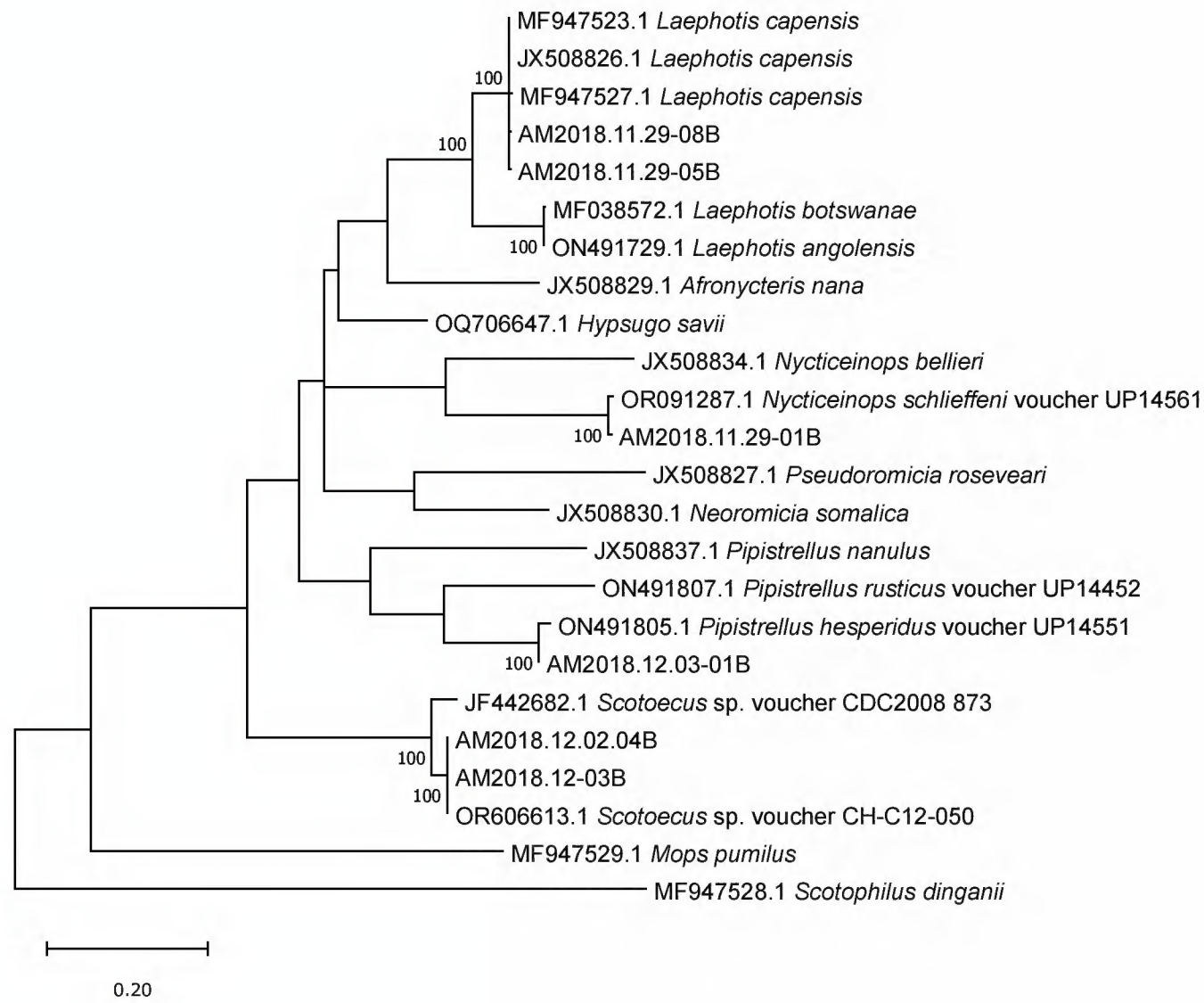

Figure A2. A phylogeny for three Vespertilionidae bat species captured at the Chimanimani National Park, Mozambique (*Laephotis capensis, Nycticeinops schlieffeni,* and *Scotoecus* sp.) based on COI sequencing.

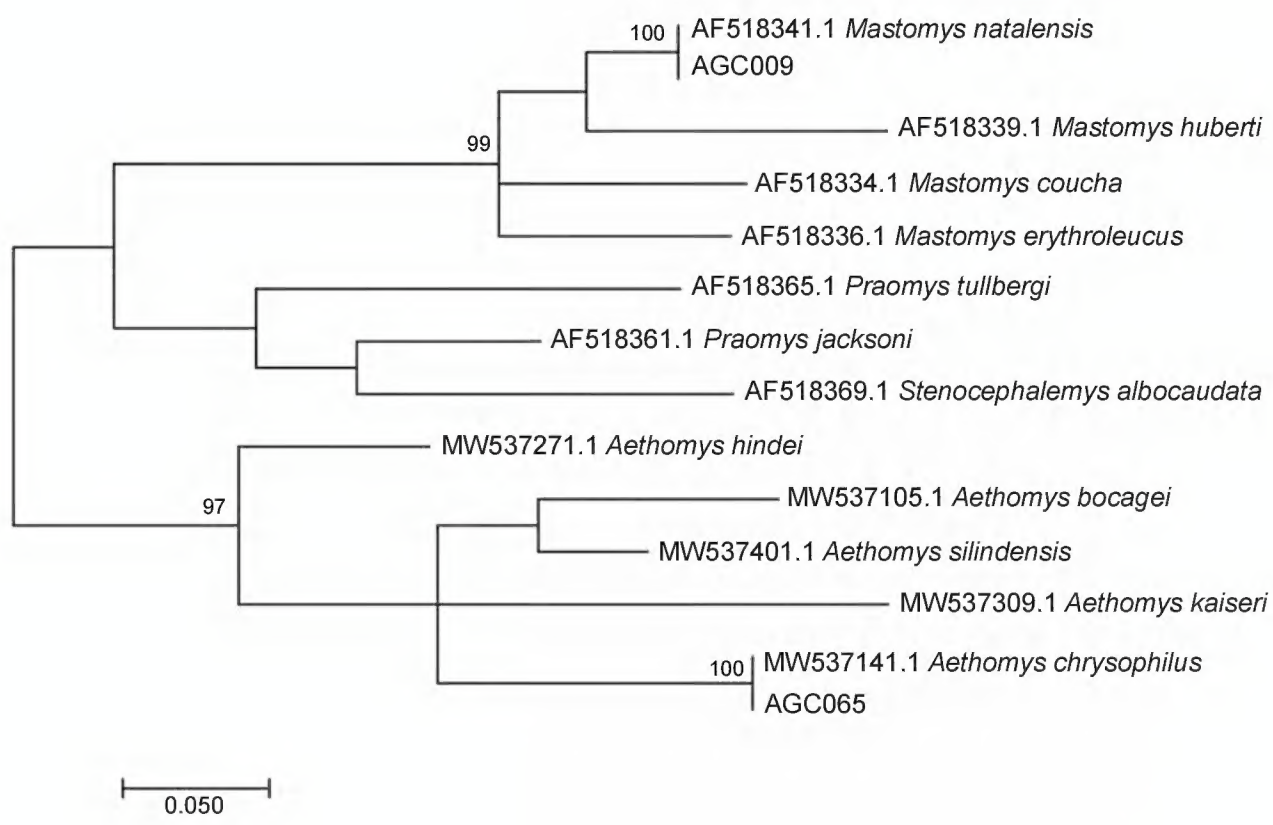

Figure A3. A phylogeny for two Muridae rodent species captured at the Chimanimani National Park, Mozambique (*Aethomys chrysophilus* and *Mastomys natalensis*) based on Cytb sequencing.

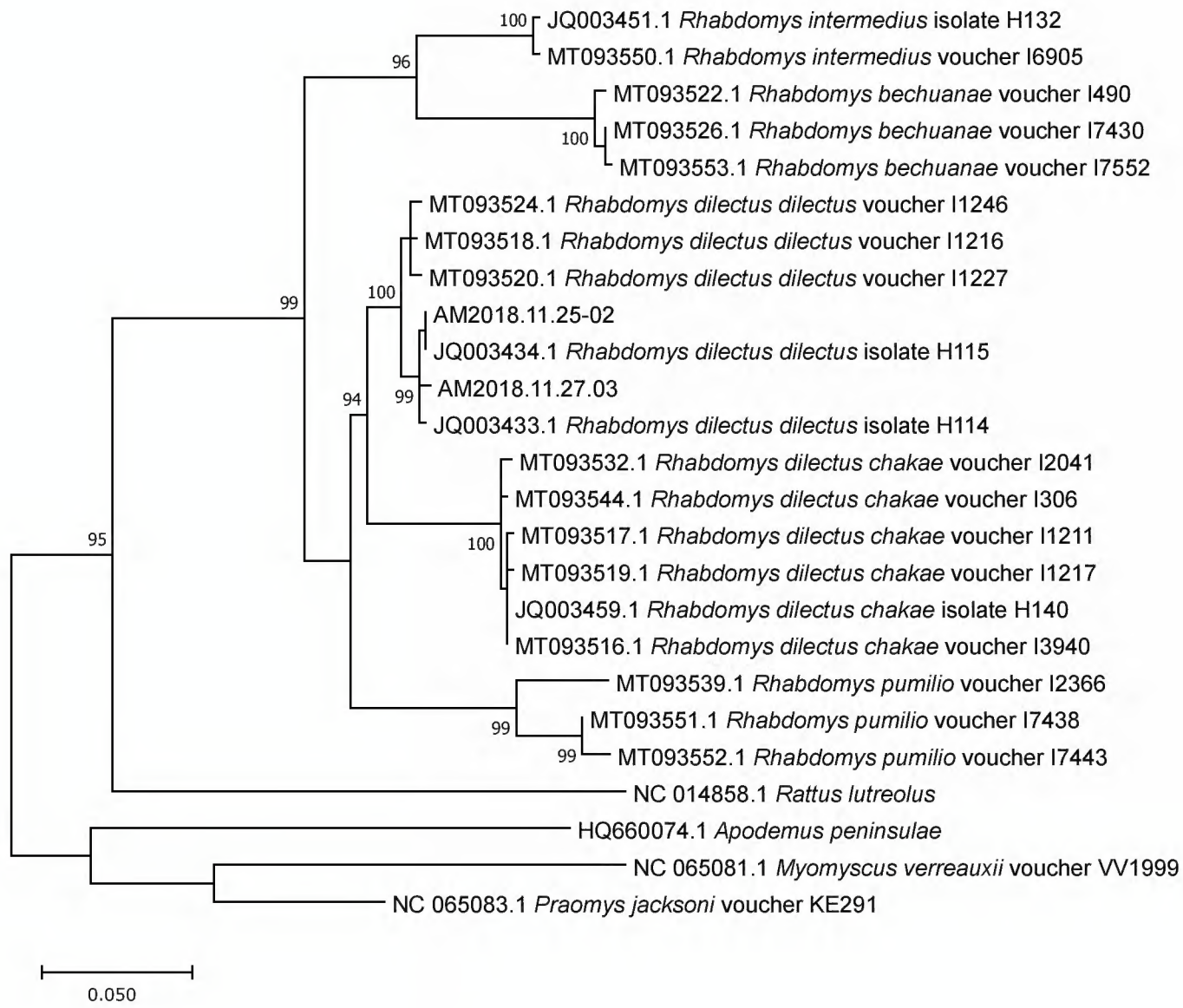
JQ003451.1 *Rhabdomys intermedius* isolate H132
MT093550.1 *Rhabdomys intermedius* voucher I6905
MT093522.1 *Rhabdomys bechuanae* voucher I490
MT093526.1 *Rhabdomys bechuanae* voucher I7430
MT093553.1 *Rhabdomys bechuanae* voucher I7552
MT093524.1 *Rhabdomys dilectus dilectus* voucher I1246
MT093518.1 *Rhabdomys dilectus dilectus* voucher I1216
MT093520.1 *Rhabdomys dilectus dilectus* voucher I1227
AM2018.11.25-02
JQ003434.1 *Rhabdomys dilectus dilectus* isolate H115
AM2018.11.27.03
JQ003433.1 *Rhabdomys dilectus dilectus* isolate H114
MT093532.1 *Rhabdomys dilectus chakae* voucher I2041
MT093544.1 *Rhabdomys dilectus chakae* voucher I306
MT093517.1 *Rhabdomys dilectus chakae* voucher I1211
MT093519.1 *Rhabdomys dilectus chakae* voucher I1217
JQ003459.1 *Rhabdomys dilectus chakae* isolate H140
MT093516.1 *Rhabdomys dilectus chakae* voucher I3940
MT093539.1 *Rhabdomys pumilio* voucher I2366
MT093551.1 *Rhabdomys pumilio* voucher I7438
MT093552.1 *Rhabdomys pumilio* voucher I7443
NC 014858.1 *Rattus lutreolus*
HQ660074.1 *Apodemus peninsulae*
NC 065081.1 *Myomyscus verreauxii* voucher VV1999
NC 065083.1 *Praomys jacksoni* voucher KE291
0.050

Figure A4. A phylogeny for *Rhabdomys dilectus* (Muridae) captured at the Chimanimani National Park, Mozambique based on COI sequencing.

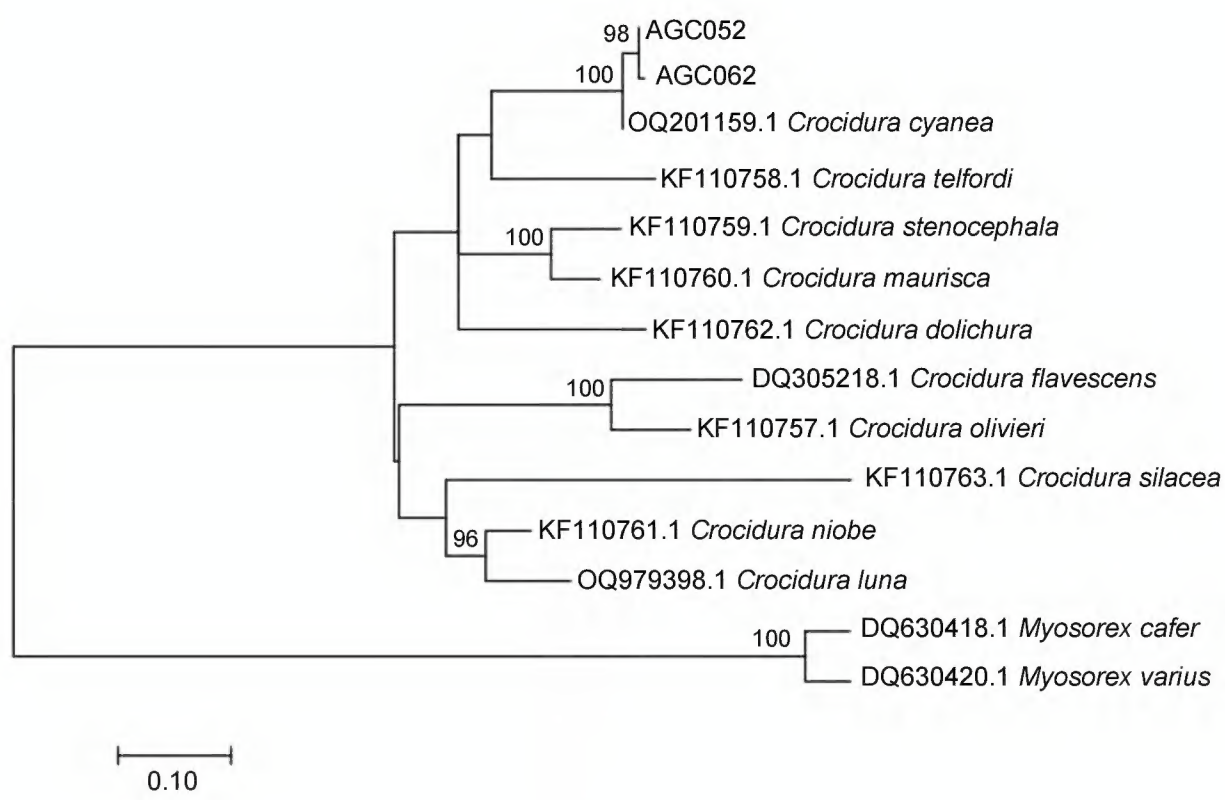

Figure A5. A phylogeny for one Soricidae species (*Crocidura cyanea*) captured at the Chimanimani National Park, Mozambique based on Cytb sequencing.